AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XLVIII
Number 15

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, APRIL 12, 1923

Thirty-five cents a copy
Three dollars a year

Entered as second class matter Jan. 4, 1913, at the post office at New York, N. Y., under Act of March 3, 1879.

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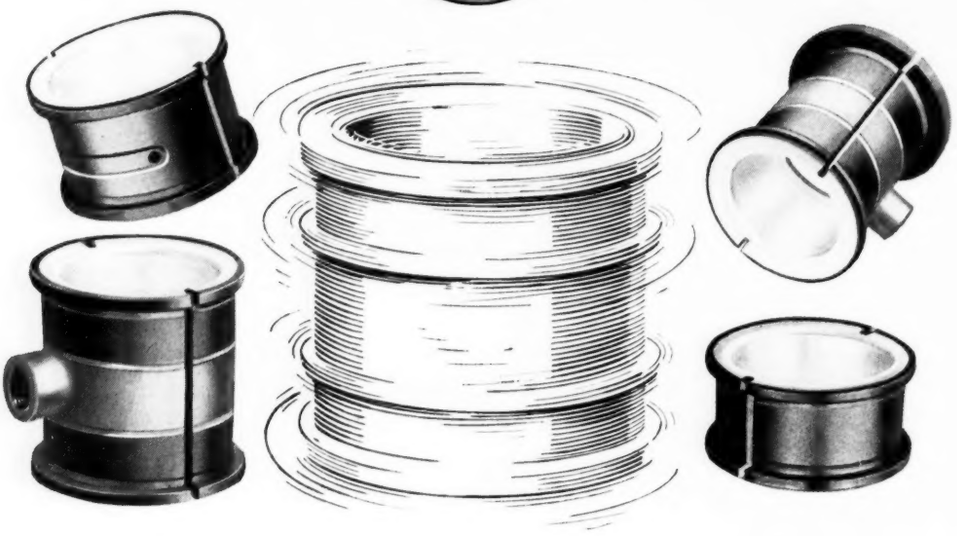

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLVIII NEW YORK—THURSDAY, APRIL 12, 1923 No. 15

Five Million Motor Vehicles Sold in Last Twelve Months

Quarter of American families have bought new or used cars in year. Huge sales volume makes consideration of immediate future advisable. No need for inflation if sanity is retained. What New England bankers think.

By James Dalton

WITH production figures for March showing that the industry is turning out motor vehicles at the almost unbelievable rate of 4,000,000 a year, the time has come for manufacturers to give serious consideration to the immediate future. The productive capacity of all American factories has been estimated at only 3,000,000 annually. It is evident, therefore, that makers are striving with all their might to increase their output. It should not be forgotten, either, that 336,000 cars and trucks were made in March in the face of material shortages and transportation difficulties.

Sales of motor cars at retail have reached amazing proportions and are more than keeping pace with production. Monthly output for the year ending with March averaged a quarter of a million vehicles with a total of nearly 3,100,000. Used cars sold in the same period must have approximated 2,100,000, making a total of considerably more than 5,000,000 transactions handled by dealers. It is estimated that there are 20,000,000 families in the United States and this sales record shows that 25 per cent of them have purchased an automobile within a year.

Business may continue at the present pace for an indefinite period but it doesn't seem probable or even possible. Few people in the automotive industry expect that it will, least of all the men who are selling its products at retail. Most responsible dealers look for a decline in sales not later than July 1 and many of them set the date from two to four weeks earlier.

If business continues at the present rate for the next two months, however, and there is every reason to expect it will, the industry will have had a splendid year, even though the bottom drops out of the market for the rest of 1923, which is scarcely likely.

The first quarter's output was 854,000. Estimating April and May at 300,000, which seems fairly conservative, we get 1,450,000 for the first five months. The total for 1922 was 2,330,000 which would leave 880,000, or an average of only 125,000 a month, to bring this year up to the record making level of last.

IF sales taper off gradually when a decline does begin, no great harm will be done provided manufacturers are prepared to curtail production to meet demand. If there is a sharp and sudden slump, however, results are likely to be more expensive unless there is ample warning of the impending break in the market.

Makers of motor vehicles will be wise, therefore, if they employ every possible means to keep abreast of the constantly changing economic situation. It will be remembered that many factories kept on producing at top speed for two or three months after business began to fall off at retail in 1920. They simply would not believe that the drive of prosperity which had swung

THERE is no sound reason why the country should suffer the sad consequences of another period of inflation.

Business, generally speaking, is better today than it ever was before. This result has been accomplished without the inordinate use of credit.

Inventories and stocks of goods have been held at reasonable levels and there has been comparatively little hoarding for speculation up to this time.

Plant capacity has not been increased to any great extent to meet record-breaking demand which promises to be transitory.

Sound prosperity is a blessing, but boom bubbles always burst, and the country is on the verge of an industrial boom if it cannot be said to be already in the midst of one.

All that is necessary to avert the suffering which always follows inflation, speculation and runaway markets is the application of sound business principles.

Production should be regulated by actual orders and finished products should not be stocked in warehouses. Even bona-fide orders can be cancelled.

If the automotive industry is conservative and is governed by principles which it knows to be sane, it cannot fail to have a prosperous year. If it runs wild it is likely to lose in the later months much of what it makes in the first six months.

Manufacturers and dealers should conserve their cash and keep their assets liquid.

upward so long had at last begun to dip. As a consequence they tied up a large part of their resources in products for which there was no immediate market.

The experience of 1920 should have given ample warning of what can happen when business is running at breakneck speed. Inventories now are small and well balanced as compared with 1920 and no such quantities of cars could be piled up as was the case in that year, but enough could be built to cut a big hole in manufacturers' profits if they did not hold output rigidly to demand. The danger is that each maker will say that his neighbor should slow down but that he is justified in going ahead at full steam.

Part of the burden of oversupply in 1920 was borne by the dealers for they were just as reluctant as manufacturers to believe that the falling off in sales was anything more than seasonal and they were persuaded to stock heavily, much to their sorrow. Those dealers who survived learned their lesson. They are watching the market like hawks and they are going to cut down their orders at the first sign of a decline in sales. They are determined to get their inventories down to bedrock by July 1 and they won't stock any more cars until they know they can sell them. Consequently, if a large surplus of cars is built up, it will have to be carried by the makers. It will keep their assets frozen when they should be liquid.

THE menace in the present situation, so far as industry in general is concerned, is the danger of inflation with runaway markets and sky-rocketing prices which sooner or later will bring a cessation of buying.

The factor which should avert the losses always attendent upon the era of deflation following overspeculation, is that almost every one seems to be fully alive to the evil possibilities of the situation.

Forewarned of what inevitably will happen unless the brakes are applied before it is too late and realizing that the time is approaching for a slackening of speed, the men of finance and industry will have only themselves to blame if there is a crash. They will have ample warning for the road ahead is plainly set with cautionary signals.

Business in the United States has reached a new high water mark and records are constantly being broken. Pig iron is a real barometer of industry and the output in March was greater than in any previous month. Car loadings show the enormous volume of trade.

Practically all lines are operating at capacity and the peak of production probably has been reached. It is likely to flatten out in the near future and then trend downward. This may result from a voluntary application of the brakes, from a reduction in the volume of sales or from forced deflation. It can be stated accurately that the country is running into a boom period but the boom probably will be short lived.

There is no reason, however, why prosperity should not continue indefinitely if reasonable caution is practiced as well as preached.

THE boom of 1910-20 followed a long period when the resources of the country had been devoted to war and normal distribution had been confined largely to necessities. When industry had reverted from a war to a peace footing, the hungry public began to buy avidly. Prices rose to ridiculous levels and the public, with its wants only partly supplied, suddenly decided it would stop buying until a dollar bill became something more than a scrap of paper. Prices fell with a sickening thud after deflation began. When they reached what the public considered a reasonable level, buying was resumed.

Demand has persisted for months and there are indications that the time is near when the public will decide that its needs have been so nearly met that it can dispense with purchases. When the "buyers' strike" does start people will be so well supplied that they can get along quite a while without suffering if they don't buy heavily.

Even if sales did slacken somewhat in this country, manufacturers could get along quite well if foreign markets could absorb 10 per cent of their output, but they can't although export demand is steadily expanding, especially in the automotive field.

Every one knows that the prices of most commodities and many manufactured products have been rising steadily for a considerable period. This ascent has not been checked, but the prices of most farm products have remained stationary or are declining with the notable exception of cotton.

Farmers possess half the purchasing power of the country. If present conditions long continue they will stop buying again and the automotive industry knows, to its sorrow, what it means to have them go out of the

market. It would be peculiarly sad to have them disappear so soon after they have again begun the purchase of cars, trucks and tractors on a comparatively large scale. It will be wise to watch sales conditions in farm districts with particular care.

Bankers of New England, Fearful of Inflation Evils, Warn Clients to Beware Speculative Borrowing

THE last deflation began with the puncturing of the silk bubble. Then New England got a terrific wallop when people stopped buying the products of its looms and spindles because prices had gone preposterously high. Sales of motor vehicles began to slip about the same time.

Conditions in New England today are similar to those which prevailed in the months before the slump of 1920. It is perfectly logical to assume that it would be the first to suffer from the effects of high wages, high prices and overspeculation.

It was the banks, led by the Federal Reserve Board, which forced liquidation three years ago and the bankers of New England are alive to the peril of the present situation. This fact is evidenced by interviews within the past ten days with high officials of the leading financial institutions of Bridgeport, New Haven, Hartford, Boston, Worcester and Springfield.

Massachusetts and Connecticut bankers are admittedly conservative but they are shrewd business men. Few of them see any especial peril in the industrial situation as it stands today, provided symptoms of inflation become no more acute, but almost without exception they believe if wages and prices keep on going up, with attendant bidding for labor and supplies and the inevitable overspeculation, the country will have run into a period of inflation which must result in a slump.

Unless present dangerous practices are curbed they expect a "buyers' strike" this year, although few are willing to predict when it may begin. Some set the date as three months hence.

Banks in Boston apparently are less concerned than those in the smaller cities but all profess to be watching loans closely and refusing credit for uses which seem speculative. A few of them confess, however, that while borrowers protest they need funds for legitimate purposes the indications are that they are attempting to use credit to increase production, which is a dangerous proceeding.

A youthful vice-president of a big Boston bank declared "there is nothing in the present situation to cause hesitation by any one less than 60 years old and with red blood in his veins," but it was significant that just before he was interviewed he had been using the telephone to discuss the advisability of raising interest rates for several large corporations "to the New York level." Apparently there are different rates for different companies.

This young financier was reminded that a good many banks wished three years ago that their loan policy had been guided by conservative octogenarians too feeble to play croquet.

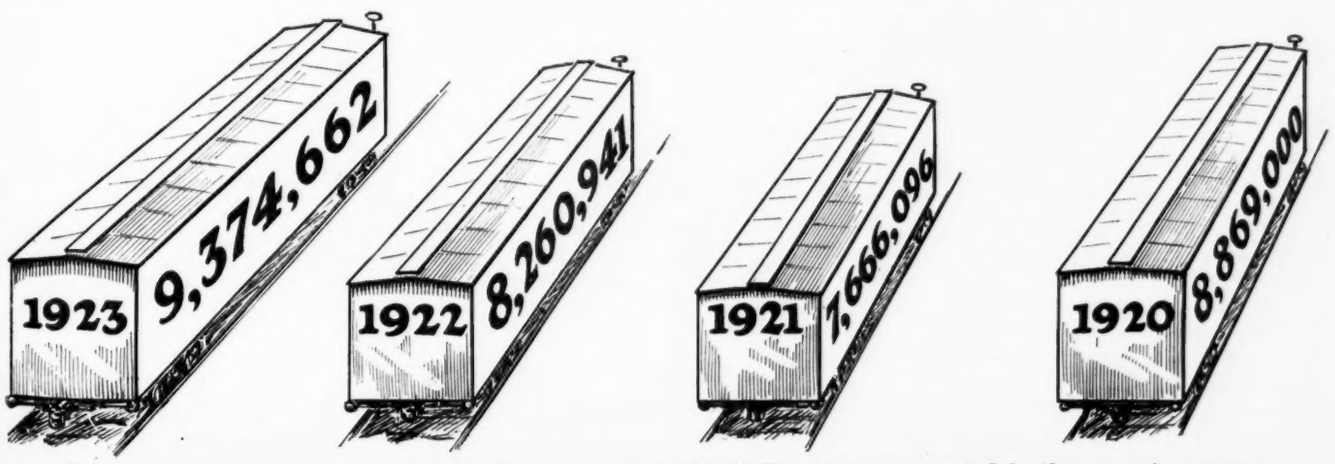
On the other hand the president of one of the largest New Haven banks said frankly that he sees inflation coming. It is having more calls for loans and its commercial deposits are shrinking, although it is significant that its savings deposits have risen $500,000 since Jan. 1. This bank is now borrowing from the Federal Reserve bank for the first time in months. It is advising all its customers to be wary and is relentlessly refusing credit which it believes would be used for speculative purposes.

The vice-president of another New Haven bank takes the same position. He is warning manufacturers to be cautious but he says that the oldest and most substantial concerns are voluntarily preparing to slow up. Applications for loans from them are rapidly increasing.

A SIMILAR viewpoint is taken by the bankers of Hartford where the banks are remarkably strong for a small city because of the huge insurance interests. They see inflation looming on the horizon and are advising a "stop, look and listen" policy. Here, too, savings deposits are increasing and retail stores are not entirely happy because of the careful buying methods of Hartford citizens. Bankers here expect a downward swing in the late summer or early fall.

The first vice-president of one of Boston's historic trust companies agrees that we are running into a period of inflation although there is nothing yet to cause alarm. He is confident serious consequences will be averted by drastic action by the Federal Reserve banks to prevent over-speculation.

The vice-president of a leading Worcester bank declared he wouldn't mind a little inflation because it meant good business, but coupled it with the statement that he believes production has reached its peak and will flatten out in the near future as the needs of the consuming public are met because there is no sharp foreign de-



Car loadings for first eleven weeks of 1923 *as compared with loadings for same period in three previous years*

mand. If foreign markets were stronger he thinks there would be greater temptation for the storing of commodities for speculation. As the situation stands he believes the law of supply and demand is working itself out. When prices get too high people won't buy because they don't have to. All bankers are watching loans closely and their conservatism in this respect is likely to be highly beneficial, he feels. A decline in sales is expected within six months.

Other Worcester bankers agree, however, that a period of inflation seems to be approaching. All of them are scanning closely the purposes back of loans. They are warning all manufacturers to keep their assets liquid and not tie them up in a surplus of finished goods for which there may be no immediate market.

These are typical of the views of more than a score of representative New England bankers and they probably summarize the opinions of most bankers in other sections.

Prosperity Era Can Be Extended if Industry Doesn't Attempt to Drive Sales Beyond Real Demand

WHILE New England is likely to be the first section to be hit by a falling off in business, the same general conditions prevail in practically all sections of the country. Commercial loans by reporting banks which are members of the Federal Reserve system are approximately $500,000,000 larger than they were at the close of December. Members in the New York district reported an increase of $117,000,000 between Feb. 14 and March 14. Large increases also were reported in the Chicago and San Francisco districts.

Wages have again begun to chase the elusive cost of living, especially in cotton and woolen mills and in the building trades. There has been a veritable epidemic of wage concessions in New England textile plants and, on a smaller scale, in southern cotton mills. The higher production costs will be reflected in higher prices to the consumer in the near future.

Most of the New England mills granted higher pay to avert threatened strikes, for the strike always is a most potent threat when business is moving at top speed. Manufacturers in that section contend, however, that they cannot afford to pay the wages demanded because of competition from southern mills where the scales are lower and where operatives can live up to the same standard for about $6 a week less.

A curtailment of building operations in many sections has resulted from the rapidly rising cost of materials and labor. Thus the goose which laid the golden egg is again approaching the chopping block. There are strong indications that the volume of construction will not approach that which has been indicated by building permits. Continued activity is expected all this year, but it probably will be on a smaller scale than in 1922. Prices of building materials have gone up approximately 24 per cent in the past year and wages probably are as high as they were at the peak in 1920.

Wage advances already made are the forerunners of many more, for employers are bidding for help and they are not likely to stand out against demands which they think their neighbors will meet. This brings to the front again the possibility of strikes by rail workers to recover what they lost under decisions of the Railroad Labor Board last year.

The steel industry expects to advance the pay of all its workers in the near future.

It all means that those industries which pay the highest scales will get the operatives. It means also that the farmers will again be left high and dry with not enough help to do their work. The fact that they will have to pay more for what they get with the prices of their produce standing still or sliding down hill isn't likely to increase their buying proclivities.

MEANWHILE the speed at which trade and industry are moving is indicated by the record of car loadings. For the first eleven weeks of 1923 they totalled 9,374,662, as compared with 8,260,941 in the same period last year, 7,666,096 in 1921 and 8,869,000 in 1920.

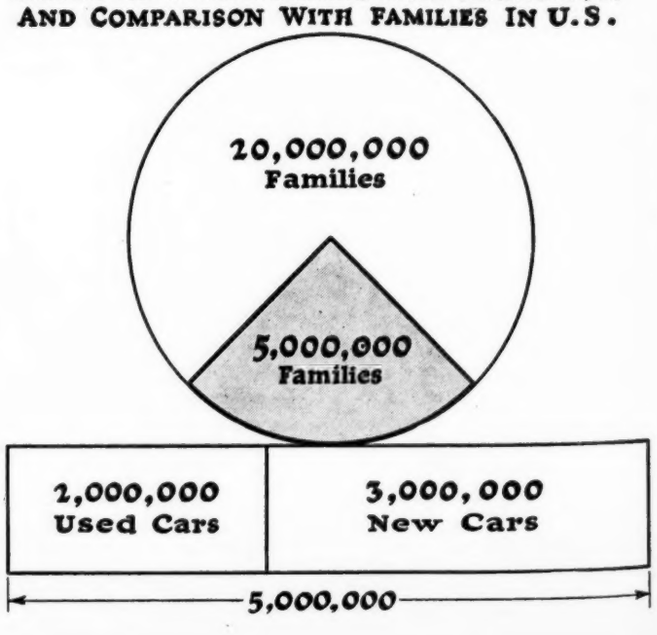
The carriers frankly admit that they are wholly unable to handle the volume of traffic offered them and the American Railway Association has adopted the report of its Car Service Division which authorizes an expenditure of $1,540,000,000 for equipment, trackage and terminals. Nearly a third of this sum was spent in 1922.

It is announced by the roads that this huge amount will be expended so that they can handle efficiently the business of the country which is expected to be at its height in October.

Railroad traffic always is at its peak in October, however, and the decision to spend this money is not altogether for the good of the shippers of the nation. The carriers have been told flatly by the powers that be that they must provide a much more efficient service than they have in the past or they will be likely to fall prey to the Government ownership advocates who will play an important part in the next Congress. Efforts which have been begun for the coordination of all forms of transportation are a part of the same program.

With all the omens of inflation which are visible to the naked eye, trade and industry should unite to keep speculation down, to prolong prosperity as long as possible and to avoid a repetition of the 1920 business crash. This is the reason why conservative men are not making commitments beyond their immediate needs and are resisting the temptation to expand their productive capacity to meet a demand which is not likely to be permanent.

CAR SALES IN YEAR ENDING WITH MARCH 1923 AND COMPARISON WITH FAMILIES IN U.S.



Better Performance of Ground Gears Justifies Production Expense

Greater durability, quieter operation and higher efficiency said to result. Grinding cost offset by obviating finish machining and by fewer tear-downs required. Improved methods may render use of helical tooth gears unnecessary refinement.

IT is possible to have perfect involute teeth and still have a noisy gear according to Glenn Muffly, of the Lees Bradner Co., who spoke before the Detroit Section of the Society of Automotive Engineers last week. The subject of Muffly's talk was, A Process of Gear Grinding and a Discussion of Tooth Form.

Ground teeth, said Muffly, are more durable, probably because they cause less vibration, and are also believed to be more efficient. He also contends that grinding is justified on a cost basis because fewer tear-downs are required and no finishing cut need be taken in machining. Greater quietness in gearing with ground teeth may also bring about changes in design.

According to Muffly, it is now possible to make gear teeth so accurate that it is necessary to consider the deflections under load and so form the tooth as to compensate for even this minute deflection if the maximum silence is to be desired. Muffly also spoke of the need for accuracy from tooth to tooth, that is, of having each tooth identical in size and contour. There is a possibility of gears being accurate when measured for perhaps one-half the circumference of the gear, but when the measurements from tooth to tooth are considered, the gear is sometimes very inaccurate. This would result in a noisy installation, although by some methods of checking the gears would appear to be exceptionally good.

Regarding the process of grinding for finishing gear teeth, Muffly stated that we can consider every tooth of a gear as a cam and the grinding of gear teeth is just as logical as the grinding of cams.

May Bring Changes in Design

Looking ahead at the possibilities which may be realized through gear grinding, Muffly pointed out that if real quietness can be secured, in the transmission gears, for instance, there might well be a tendency toward overgeared four speed gearsets. With traffic conditions as they now exist in large cities, there is more gear changing and if quiet gears can be secured, it will be possible to narrow the engine speed range and, consequently, increase the economy of the vehicle. He cited the Citroen car which, with a four speed gearbox was reported to have obtained mileages as high as 40 per gal.

Muffly said that grinding is justified on a cost basis because it decreases the number of tear-downs required and, furthermore, the price of grinding cannot be fairly added to the present price of gears finished by other methods because it must be remembered that the finishing cut taken in this case is eliminated, only the rough cut need be taken on the gears before grinding.

Another possible effect of accurately ground gears is the return from helical to straight tooth spur gears for timing purposes. Muffly stated that the Lees Bradner Co. was to a great degree responsible for the development of the helical timing gears, but now is seriously considering whether the ground gear might not mean a return to the spur type of gear.

The speaker stated that the same factors which caused noise and gear wear are those which cause loss of efficiency and, consequently, it is reasonable to expect that the more quiet gears are more efficient.

In answer to a number of questions, Muffly made replies which are summarized below:

The grinding time per tooth can be very quickly calculated. As an example on a 15-tooth gear taking one cut per tooth, the time averages 14.4 sec. per tooth. On a 21-tooth gear, 9.6 sec. and on a 29-tooth gear, 8.4 sec. These figures refer to 6-8 pitch gears.

Wet Grinding Process Employed

The grinding process employed is a wet grinding, hence the heat generated does not draw the gear material.

In the case of one type of gearset it has been found that after 38,850 teeth had been ground on both sides, with two cuts to each side, the cost was $1.75 per gearset.

It makes little difference how close the center distances are held, but the shafts must be parallel. It must be remembered that shafts are not necessarily parallel even when the distance between them at each end is exactly the same.

The stock left for grinding after the rough cut on the gear averages from .002 to .003 in. on 8-10 pitch gears.

It is not advisable to grind both sides of the gear at once as it brings in too many factors which must be kept synchronized. The maximum variation for back lash in these ground gears is .00025 in.

In response to a question as to whether or not the variation in oil causing differences in the thickness of the oil film would not more than compensate for the accuracy of the tooth finish itself, Muffly stated that this was perhaps true. He stated that as the accuracy of the teeth increased, it eventually reaches a point where this accuracy is offset by other inaccuracies particularly in other machining operations.

Action of Compensation in Tooth Form

Another question which several asked was whether or not compensating in the tooth form for the deflection due to heavy load would not make the gears noisy when running under light load. To this Muffly replied that if the heavy load condition is taken care of first the light load condition would be automatically taken care of, and that the virtual results will be to have what practically amounts to a stub tooth under light load with a full tooth bearing under the maximum load.

This condition, he stated, is due to the fact that after the compensation is made the tooth does not bear at the tip and at the base.

Just Among Ourselves

Here's a Bank Financing Sales "Without Recourse"

FINANCING time sales of motor vehicles on the "no recourse" plan, which means without indorsement on the notes given by the purchaser, has been condemned as unsound because the dealer who sells the car or truck has no responsibility and because the buyer of the paper has no security beyond the credit of the maker. There is one big bank in Boston, however, which finances the sales of both new and used Ford cars and trucks on this basis for the dealers in that city. It contends that losses are practically negligible and that such as it suffers are covered by a bonding company. Financing of new car sales, without recourse, even by a bank, is not nearly so surprising as the acceptance of paper given in the purchase of used vehicles on the same basis.

What's Sauce for Geese Is Sauce for Ganders

WHILE American tire manufacturers, practically at the mercy of British producers for their supply of crude rubber, are seriously concerning themselves with the feasibility of establishing their own plantations, British cotton spinners are protesting that America has no "God-given monopoly" on the raising of cotton. "Lancashire will be obliged to safeguard itself in the matter of quantity and price," says Sir Charles W. Macara, Bart., an authority on the cotton industry, in an article contributed to the *Textile World*. It makes a great deal of difference whose pussy cat's tail is caught in the door, as it were. British rubber producers are restricting output with the deliberate purpose of forcing up the price. Some American cotton planters curtailed their acreage to keep prices up, but the boll weevil and the weather are the chief limiting factors. Price is determind by the law of supply and demand. We wonder if our British cousins can see the humor of the situation. Cotton is much more essential to them than rubber.

Governor Pinchot Rather Rapid in His Repartee

GOVERNOR PINCHOT of Pennsylvania is rather rapid in repartee. He's deeply interested in road building and that was the reason he called a conference of highway commissioners at Harrisburg recently. Col. Frederick Stuart Greene, New York commissioner, is a firm believer in reinforced concrete and he built a road of this material along the Susquehanna across from the State capitol. Turning to Pinchot, who was listening interestedly, Greene said:

"If that road doesn't last more than 30 years you can put me in jail, governor."

Then he went on quoting maintenance costs. After he had finished and sat down, Pinchot asked, "What about that road after 30 years?"

"I told you that you could put me in jail if it didn't last longer than that," replied Greene.

"Well, assume you are in jail," shot back the governor.

Publicity Man Forgot to Cut Out Boomerang

AUTOMOBILE publicity men, keen and clever as they are, sometimes overlook boomerangs in their stories. One of them recently sent broadcast a readable yarn designed to emphasize the wearing qualities of the sterling car he represents. The hero was a farmer who had owned several of them and got a tremendous amount of work out of them. He evidently was using the latest one, which was several years old, to haul freight, for the publicity man said he got 4500 pounds of coal in the commodious tonneau. That was good propaganda, of a kind, but he didn't stop there, for in the last paragraph of his story he quoted the owner as saying as follows:

"I don't care much about what they call improvements. I took 'em all off and she ran a darned sight better. They're putting too many new fangled notions on the late ones."

And this in an era of "fully equipped cars" which one man described as having everything attached except the kitchen stove.

Trucks Don't Cause All Damage to Highways

A. F. MASURY, chief engineer of Mack Trucks, Inc., believes motor vehicles are blamed for a lot of road damage for which they are not responsible. He has sent a letter to all branch, district and factory managers in which he emphasizes this contention. He points out that weather conditions cause very heavy damage to highways and that it is more apparent in spring than at any other time of year. He suggests that photographs be taken of improved roads filled with pot holes, ruts and water pockets and filed with highway commissioners as indisputable evidence that frost, ice and snow were responsible rather than the trucks which usually are blamed. He then goes into a careful analysis of the reasons for road damage as the result of weather and atmospheric conditions. His arguments are perfectly sound and they give good material with which to counteract the propaganda of those interests which

More or Less Pertinent Comment on Topics of Current Interest to Men in the Industry

contend motor vehicles don't pay for the damage they cause the highways.

Trans-Continental Touring Assumes Big Proportions

THE Automobile Club of Southern California is running page ads in the *Saturday Evening Post* showing improved highways leading to the coast from Canada, Chicago, New York, Washington and Florida. It describes the delights of motoring in California and enumerates the services given by the club to make pleasant the visit of tourists to that State. The map shows all the trails across the continent and the advertisement is striking proof of the proportions which trans-continental touring has reached. It has become a big asset to the automotive industry. All the Shriners on the coast are expected to drive their cars to the annual convention in Washington in June, and home again. This great calvacade will demonstrate how easy it is. It also is likely to profit greatly the service stations along the way.

Wanted to Get Credit on His Demonstrator

NEW ENGLAND banks rather pride themselves on always being willing to meet the legitimate credit needs of responsible automobile dealers for financing their wholesale purchases. Because of their attitude in this respect they get some rather odd pleas. A young chap went into one of the big banks in Worcester the other day and announced that he had taken on the agency for a car which has had a mighty small sale in that territory. He told the vice-president proudly that he even had dug up the cash with which to buy a demonstrator.

"What I've come in for," he said, "is to see how much credit you'll give me on my contract with the company and on the demonstrator."

He couldn't understand why the banker shook his head sadly and sent him away, but the guardian of other people's money said it wasn't an isolated case.

What Used Car Losses Mean to the Dealers

THE National Automobile Dealers' Association has figured out that the dealers of the country had 400,000 used cars on their hands on March 15. Their value is fixed at about $152,000,000 and it is estimated that the losses on these stocks the first three months of the year were approximately $23,000,000. This isn't a pretty picture. The average dealer discount is about 20 per cent and this loss would equal the amount dealers would make on the sale of new merchandise with a retail value of $115,000,000. This would mean, in the $2,000 class, more than 50,000 automobiles or a very sizable chunk of the year's business.

It undoubtedly is true that the better business men among the dealers are not losing so much money on used cars as they once did, but the aggregate on the wrong side of the ledger is very large. The saddest part of the picture is that the market for these vehicles promises to be very weak about mid-summer with a whale of a lot of them on hand and few takers.

Star to Compete With Both Chevrolet and Ford

THE Durant car which will be designed to compete with the Chevrolet and which will sell at the same price, will be a Star product, although the name has not been definitely decided upon. The plant at Flint will be owned and operated by Star Motors, Inc. When running at capacity it will employ about 4000 men. The Star chassis probably will be used with something special in the way of a body. When the Durant plants now under construction are completed his factories will have a capacity of nearly 700,000 automobiles a year.

Incidentally, W. C. Durant doesn't expect anyone in his organization to work any harder than he does. He had 33 appointments last Friday and was still talking with one of his visitors at 2 a. m. Saturday morning. He was back at his desk seven and a half hours later, apparently as fresh as a daisy.

"Saturation Point" Bogey Is Swatted Once More

THE Bureau of Public Roads has hastened to deny that it was sponsor for any statements which could justly have been interpreted as meaning that the "saturation point" would be reached two years hence with a registration of 15,000,000, but a denial seldom catches up with misinformation. Chief MacDonald of the Bureau of Roads and his responsible assistants are level headed persons who have a broad vision of the future of the motor vehicle. They realize as well as any one in the industry that there can be no such thing as a "saturation point" until the country stops building good roads. That day probably never will come and they know it better than anyone else. It would be just as sensible to talk about the saturation point for pianos, washing machines, phonographs and telephones. The market won't be saturated until every family has one or more of each.

J. D.

Far-Reaching Effects Are Predicted for Large Section Tires

May prove one of the most important developments of recent years. Chief advantage is easier riding quality which is given car. Freedom from skidding, increased traction and lower unsprung weight also important. Some chassis parts must be redesigned.

By Herbert Chase

WHAT may turn out to be one of the most important and far reaching developments in recent years in the automobile industry is that having to do with large section thin wall pneumatic tires, which, it seems certain, will soon be manufactured in considerable quantity by several prominent tire manufacturers. This development concerns not only the tire industry but is expected also to have a pronounced effect upon the design of passenger cars and of many parts which enter into their manufacture.

From the standpoint of the user, who is, of course, the ultimate judge of the value of any important development in passenger cars, the feature of greatest moment which the new tire involves is the marked improvement in riding qualities which is given the vehicle as compared to a similar vehicle fitted with cord or fabric tires of conventional type.

It will be recalled that the transition from fabric to cord tires was accompanied by a marked improvement in riding qualities. This was due very largely to a decrease of about twenty per cent in inflation pressure which was permissible on account of the greater flexibility of the tire wall.

The new type of tire, built in the proportions proposed, makes it possible to utilize inflation pressures as low as twenty pounds per sq. in. or about one-third that commonly used in ordinary cord tires. This very radical decrease in pressure naturally produces a corresponding ease in riding. In fact, the difference is so pronounced that some engineers who have used the new type of tire state that they not only improve to a marked degree the riding qualities but produce an entirely different and very pleasing sensation described as more like gliding than ordinary riding. Rolling from side to side, which might be expected, is said to be inappreciable even in rounding a sharp turn.

No Effect on Steering

According to the United States Tire Co. the new tires are without effect upon the driving characteristics of the car. Steering is said to be no harder than formerly, at least when the car is moving, but harder turning of the steering wheel with the car stationary is one objection.

The advantages of the new type of tire are by no means confined to the improved riding qualities which it gives the vehicle upon which it is used. Other advantages include better adhesion to the ground with consequent decrease in slipping and possible elimination of skidding. The larger and softer tire has, of course, a considerably greater area of contact with the ground. For this reason the unit pressure for a given weight is considerably lower and there is less tendency for the tire to sink in on soft footing.

Possibly for the same reason, there is said to be less chafing in ruts and less damage to the road. This quality should help to make the car a better all-year and all-purpose vehicle by enabling it to operate on surfaces which are too soft for narrow tires. This characteristic should be especially appreciated by the farmer whose car is often rendered useless during seasons when the roads are soft.

May Have Longer Life

Opinions differ as to the comparative wearing qualities of the conventional type of cord and the newer type which, of course, is also of cord construction. The use of the new type tire undoubtedly results in some saving in unsprung weight and, consequently, in a secondary saving in respect to the lesser impact on the road surface. This might be expected to lessen tire wear and result in longer life for a given grade of tire.

There appears to be no question but that the new large section tires with their lower inflation pressure absorb a much larger proportion of the shocks due to the smaller road inequalities which not only make riding uncomfortable but also create vibration which is destructive in its effect upon the chassis. This quality naturally results in less fatigue to the operator and greater comfort for passengers. It also increases the life of many parts of the car.

One experimenter says that a certain car fitted with 33 x 5 in. cord tires required as much as five hours labor per week spent in adjustments necessary to keep the chassis quiet. When 34 x 7 in. tires were substituted, practically no labor was required on this score for a period of nearly five months. Cars with the new tire are said to be noticeably quieter in operation than when equipped with ordinary cord tires.

Substitution of the 7 in. for 5 in. tires is reported also to have increased the maximum speed of one car and lowered its fuel consumption as well as brought about other advantages already mentioned. It is said that this car with 7 in. tires handled better under slippery conditions without chains than it did with 5 in. tires fitted with chains.

The better adhesion which the large section tire affords, naturally, results in a greater braking effect which, together with the decreased tendency toward skidding, should make for greater safety. One large tire manufacturer expresses the view that, on account of these qualities, four-wheel brakes, which have found

much favor abroad and are being seriously considered by several manufacturers in this country, will prove quite unnecessary on American passenger cars.

While the advantages of the new construction apparently outweigh by far the objections to the newer form of tire which have been raised, it cannot be denied that there are some objections to its application and, possibly, some disadvantages in its use.

May Involve Chassis Changes

Among the disadvantages may be mentioned that involved in making any change in equipment which involves changes in other parts of the chassis. For approximately the same diameter, a large section tire will have less side clearance in relation to body and chassis parts, if these are not changed accordingly. In some cases this might require a decrease in the width of the rear seat and a decrease in the width of the chassis, at the front, in order to enable the same steering lock and thus maintain the same turning radius.

The change to large section tires involves also the use of a smaller diameter of wheel and rim and may, in some cases, affect the brake design.

Another more serious disadvantage is the possible increase in danger from accident in case of a blowout with the car traveling at high speed. Such accidents have been known to occur even with the conventional tire equipment. That they would be more serious, or more likely, with larger section tires is a matter open to some question.

Appearance will perhaps count against the newer form of tire temporarily, but will probably be of small moment when the advantages are fully realized. Similar objections to other improvements have been quickly forgotten in the past.

Tire dealers naturally will not be enthusiastic over the introduction of new sizes which require the carrying of an additional stock of tires during the period that existing cars require replacement of present standard tire sizes. This is a disadvantage but one which is no more serious than others which arise in a period of transition from one type of equipment to another.

Just how the new type of tire will compare with existing types of cord tires in respect to life, freedom from tire trouble and internal friction, with its corresponding effect upon fuel consumption and maximum speed, appears to be somewhat uncertain, though gains in these respects have been reported. Some tire manufacturers do not anticipate any great increase in life of the tire but some tests appear to indicate that marked savings in fuel economy, which may, perhaps, be credited to a decrease in the internal friction of the tire, have been attained in some cases. Decreased internal friction has a favorable effect on tire life.

Wheel manufacturers seem to be favorably inclined toward the large section tire, while the engineers of car manufacturing companies who have expressed an opinion, speak well of the new development and believe that it has generally beneficial results.

All things considered, the large section tire may ultimately work more or less of a revolution in passenger car design. It may make possible the use of lighter construction than is now thought feasible, especially where poor roads are encountered. It may result in marked changes in spring design and may have an important bearing on the design of other portions of the chassis.

Adoption of New Tire for 1924 Models

Some prominent car manufacturers are said to be seriously considering the adoption of 34 x 7 or 32 x 6 in. tires as standard equipment in the near future and it is not unlikely that a number of 1924 models will be equipped with the new form of tire.

While some of the tire companies are rather noncommittal on the subject at the present time, others are expected to have the large section tire on the market within a few weeks. Their production in quantity will naturally depend upon the demand which develops for them.

One manufacturer of wire wheels has recently announced a twenty in. wheel to be sold in sets of five for replacement purposes on light cars. These wheels will be equipped with 28 x 4 in. cord tires and replacement will be available through the wheel manufacturer until such time as this size is generally available on the retail market.

In order that the industry may have a comprehensive view of the new development, AUTOMOTIVE INDUSTRIES has secured expressions of opinion from several car and

Advantages Claimed
For Large Section Tires

1. **Greatly improved riding qualities, resulting in:**
   Greater comfort and less fatigue for passengers and operators.
   Less vibration.
   Fewer adjustments to prevent rattles.
   Increased life of car.
2. **Freedom from skidding.**
3. **Increased traction and braking action.**
4. **Less wear on roads (minimizes rutting of soft roads).**
5. **Quieter operation.**
6. **Lower unsprung weight.**
7. **Permits lighter chassis construction.**
8. **Operates with lower inflation pressure.**
9. **Less trouble from leaky tire valves.**
10. **Less side chafing in ruts.**
11. **Possibly longer life of tire.**
12. **Possibly lower internal friction with corresponding saving in fuel.**

Possible Disadvantages
Of Large Section Tires

1. **Less tire clearance for given body and chassis width, resulting in:**
   Longer turning radius and narrower rear seats, either of which can be obviated by changes in design of vehicle.
2. **Need for redesign of some chassis parts such as wheels, rims, and, in some cases, brakes, frames and other units.**
3. **Increased danger of accident due to blowout with car traveling at high speed.**
4. **Greater effort required to turn steering wheel when car is not in motion.**
5. **Possible objection to appearance.**
6. **Temporary need for greater number of tire sizes manufactured and to be stocked for replacement.**

parts manufacturers, as well as from various tire companies who have been doing work along this line. Some of these views are given in the following pages, a majority of them being direct quotations from engineers and executives who have written us on this subject. The views of others, qualified to express an opinion on this important subject, will be welcome.

Rough Roads Become Strangely Smooth

By S. P. Thatcher

Technical Assistant to President, United States Tire Co.

THE United States Tire Company has for many years been interested in solving the problem of better cushioning of the automotive vehicle. Long before the days of the cord tire we were experimenting with larger section, thin carcass fabric tires, but due to the inherent faults of square woven fabric these tires did not deliver sufficient mileage. They were, however, very efficient cushions.

With the universal development of cord tires, we, of course, recognized the probability of the cord carcass solving our cushioning problem, but, up to two years ago, our research and development activities were devoted to more urgent needs.

The "balloon" tire—to give it the popular appellation—is essentially of the same outside diameter as the present conventional tire size, but of much larger section and fewer plies. This is accomplished by using a smaller rim diameter. For example, in place of a 33 x 5 in. eight-ply cord tire on a 32 x 4½ in. rim 23 in. in diameter, we use a 34 x 7 four-ply tire on a 29 x 4½ in. rim 20 in. in diameter, and operate it at 25 lb. inflation pressure instead of 65 lb. The results are almost uncanny. Rough roads become strangely smooth. Brakes exert a new power. Slipping and skidding on wet pavements do not occur.

You suggest in your editorial that this new tire may offer the possibility of as great an improvement in mileage and ease of riding over the present type of tire as the latter did over the fabric tire. We do not look for any substantial increase in tire mileage, but, so far as riding qualities are concerned, the automobile becomes an entirely different vehicle. Riding on "balloon" tires is a new sensation. Nothing like it has ever been experienced before. The car seems to glide rather than roll.

Cushioning in a pneumatic tire is inversely proportional to inflation pressure—the lower the pressure the greater the cushioning. The cord tire is a better rolling cushion than the fabric because it can be operated at somewhat lower pressures without injury from flexing. A 5 in. fabric tire, according to S.A.E. standards, is rated to carry 85 lb. inflation pressure, while the 5 in. cord is rated at 80 lb. The latter can, however, be safely operated at 65 lb. pressure under average load conditions. Now comes the "balloon" tire, which can carry the same load at only 25 lb. inflation. The reason for its wonderful riding qualities, is therefore obvious.

Another feature which should be borne in mind is the marked reduction in unsprung weight. The 34 x 7 in. "balloon" tire, rim and wheel weigh less than the 33 x 5 in. tire, rim and wheel, and, therefore, the chassis stresses, imposed by the action of the loads below the springs, are correspondingly lessened, and the general "roadability" of the car improved. This, of course, results in slower depreciation of the vehicle.

It has recently been said that the pneumatic tire is a shock transmitter rather than a shock absorber and, therefore, has not fulfilled its real purpose. This is particularly true of the large pneumatic truck tires operating at pressures above 100 lb. per square inch, and while the vehicle is being operated without a load. Under those conditions the pneumatic is not as good a cushion as a solid tire, although, of course, its other qualities make it more desirable equipment under certain conditions of service. But with the ultimate development of the "balloon" tire this general indictment will have to be quashed—at least so far as it applies to passenger car pneumatics.

It has been pointed out that the adoption of the "balloon" tire will complicate the tire merchant's problem through the introduction of more tire sizes; that chassis design will have to be modified to suit these new dimensions; and that the incongruous appearance of the vehicle equipped with these super tires will militate against rapid popularity. These are not insurmountable obstacles. More serious ones have been met and easily overcome during the steady progress of tire development, and some of these developments have not involved nearly so great an improvement in the tire as is offered by this latest one.

Reduces Tire Maintenance Costs

By P. W. Litchfield

Vice-President, Goodyear Tire & Rubber Co.

THERE is a general desire on the part of the riding public to get low cost tire mileage, and also easy cushioning and comfortable riding. It has been difficult, up to date, to give the average motorist both of these at the same time, as the average tire equipment has been of such size that it has required great inflation pressure to insure durability.

The entire load of the car is carried by a volume of air under pressure, and, of course, the smaller the air volume the higher pressure is required to carry the given load. It has been well known for some time that large air volume at lower pressure would give more satisfactory results in ease of riding and lower maintenance costs without increasing tire cost.

Tires of this nature would have light, flexible sidewalls, and would not successfully stand the high pressures required for heavy loads. To successfully market such a tire it is essential that they should not be applied to cars now taking tires of the same size, but they should only be used in over-tiring cars of lighter weights.

Trend Is Toward Larger Tires

By L. M. Stellmann

Chief Engineer, H. H. Franklin Mfg. Co.

IT is the writer's opinion that the tendency in design will be toward tires of larger section with thinner walls and lower inflation pressures. We have a few cars running about the plant with 32 x 4½-in. 4-ply tires operating with 35 to 40 lb. air pressure. Our normal tire equipment such as we are putting into production now is 32 x 4-in. 6-ply, which we operate with 45 to 50 lb. air pressure.

The larger section thin-walled tires give us a much easier riding car carrying an air inflation of from 25 to 40 lb. and they seem to be standing up satisfactorily so far as service is concerned. With these larger tires we are able to use 31 x 4-in. rims, which give us considerably less unsprung weight than with 32 x 4-in. tire and rim equipment, which is our regular specification.

The writer is operating on his own personal car a set of 30 x 5-in. tires on 29 x 4½-in. rims. These tires are being operated at about 15 to 18 lb. air pressure and the anti-skid feature, general car performance and riding quality of the car are very much better than with the 32 x 4½-in. tires. There will, however, be a low limit to which it will be desirable to reduce the wheel diameter because

of road clearance. No doubt this is the general trend of tire design at the present time and the writer can see no reason why it should not work out in the long run. The heavier cars will probably have to make this change first.

Favored by Wheel Manufacturer

By F. H. Le June

Chief Engineer, Hayes Wheel Co.

WITH reference to your editorial entitled "Will Larger Section Tires Be Generally Used?" I must say that the trend seems to be in that direction. If this develops as standard practice, there are several points for and against it. You have stated some in favor of this practice, but of the greatest against it will be the greater consumption of fuel per mile. Its effect on the wheel, which is the part in which I am most interested, will be to make it smaller in diameter, therefore using less material and making the stress upon it of a lesser nature.

These points are all good ones as far as the manufacturer of the wheel is concerned.

New Tire Effects Many Savings

By A. L. Putnam

Research Engineer, Motor Wheel Corp.

I NOTE in a recent issue the query, "Will Larger Section Tires Be Generally Used?" and also a page of very fair comment on the subject. As a very strong advocate of the use of larger tire sections in proportion to the load, I say yes. I also will give you some reasons why they will come into universal use within two years.

I discovered a good many years ago that nearly all the designers and many of the users of automobiles had a purely instinctive inarticulate appreciation of the fact that at the moderate speeds at which 99.5 per cent of the mileage has to be made, the air pressure in tires was so high that their pneumatic quality was undiscoverable. A small articulate cry was made at the 1921 winter meeting of the S.A.E. in New York, when I read a paper upon "Chassis Design with Reference to Fuel Economy." That paper laid considerable stress upon the injurious effect of very high air pressure tires and the immense improvement a change to larger sections and lower pressures would make for the same load.

The statements then made were largely from induction and theory; since that date the proof has been forthcoming.

To give a specific instance: Cadillac Model 55, changing tires from 33 x 5 in., carrying 65 lb. of air in rear and 55 lb. in front, to 34 x 7 in., using 32 lb. in rear and 28 lb. in front. First fact—the 34 x 7 in. tires with the above pressures are rounder than the 33 x 5 in. with the pressures given, which are as low as they can be run fast without excessive tire heating.

Second fact—33 x 5 in. tire rim and wheel weighed 85 lb.; 34 x 7 in. tire, rim and wheel, 68 lb.

Results without other changes in car—4 miles per hr. faster maximum speed under most favorable conditions. Eight to 10 miles better average speed under touring conditions. Gasoline mileage changed from 10 or 11 miles per gal. to 13 or 14.

In this past extremely slippery winter the 7 in. tires gave more safety without chains than the 5 in. tires with chains. With 5-in. tires car always required several hours' labor a week to keep chassis quiet. From November, 1922, to April, 1923, with 7-in. tires no labor on chassis and no noises.

Less fatigue in driving 400 miles in one jump than 250 with 5 in. tires.

Have often ruined 5 in. tires in the spring due to side wall chafing in ruts, the 7 in. have been subjected to more than usual of this class of mileage and there is not a mark on them.

As under the steady daily driving from November to April the tires are as good as the day they were unwrapped, there is no question as to durability and service. The 33 x 5 in. and 34 x 7 in. are of practically identical circumferential diameter.

Put one 33 x 5 in. tire on one side of rear with 80 lb. of air, 34 x 7 in. on the other side with 35 lb. of air, drove 45 miles on good gravel road at speed 40 to 45 m.p.h., end of run 7 in. tire slightly warm at tread, side walls cooler than atmosphere; the 5 in. cord on other side just right heat to scramble an order of eggs.

This experience has been confirmed by at least thirty other men who, driving large cars with 5 in. tires, have changed to the 7 in., and everyone of them are done with small high air pressure tires. These men are also ones whose opinion, judgment and power in the industry count.

The taxicab use which you cite is simply another illustration on a smaller, lighter scale of the same principle, which is proving out in a direct dollars and cents economy. Also they started with only a few hundred sets last winter and now have over 4000 sets of small wheels and large tires on order. This is about as conclusive proof of value received as anyone can ask.

The substituting of a device or combination which really does work for something which does not work is a pretty hard thing to stop, no matter what the vested interests. It would also be nothing but industrial suicide, as it is a fact that doubling the cross-sectional area of a tire for a given load, and cutting in one-half the air pressure double the scope and utility of the automobile, and helps the total growth of the industry.

The universal use of these tires would also save hundreds of millions in road repair and maintenance. As an illustration, I have 400 ft. of good gravel drive, not a rut in it, this spring, until a little 2000 lb. car with 3½ in. tires, came in one day and ruined it.

Increases Life of Car

By E. H. Belden

Assistant to President, Willys-Overland Co.

I HAVE had the pleasure of taking a short ride in an automobile equipped with large section tires. I was very favorably impressed with the demonstration and believe that it has a very great amount of merit. I will make further investigations and tests with a great deal of interest.

If it has no faults so far as the life of the tire is concerned, or the handling of the car under all conditions, it is sure to be a winner, because there is no doubt but what it will increase the life of the car itself.

Will Aid Standardization

By Alex Taub

Engineer, General Motors Corp.

ADVANTAGES in the use of larger section tires far exceed the advantages found by the adoption of cord tires over fabric. This change will lead to an improved riding quality, longer life due to lower unit pressure, and also to lower frictional contact between road and tire, lower unit stress on carcass of tire, minimized slow leak trouble due to lower pressure, and last but not least, a standard-

ization in the matter of diameter of rim disks where steel wheels are used, and other parts that go to make up a wheel.

The cost should not exceed the cost of the present equipment, since there will be sufficient material saved in construction of wheels to offset any excessive cost in tires, if any.

Low Inflation Gives Many Advantages

By W. H. Allen

Technical Director, The B. F. Goodrich Co.

WE have read the editorial on larger section tires in your issue of March 15, and find it a generally correct summary of certain recent developments. Experimental fittings have been made on passenger cars, involving the use of tires as large as 34 x 7 in.

It seems to be a fact that when such tires are especially designed along the line of reduced weight and suitable profile, inflation pressures may be considerably reduced and there follows the following advantages:

(1) Decreased unsprung weight.
(2) Reduced vibration from which increased car life might be expected to accrue.
(3) Greater riding comfort.
(4) Improved traction.
(5) Noticeably quieter in operation.

We are not prepared to say whether the steering effort will be increased nor what fuel consumption will develop, whether more or less. It is our opinion that automobile engineers and manufacturers will interest themselves in a careful study of the possibilities as a result of preliminary development to date. We believe increased sectional sizes of tires are not at all improbable, although there may be limiting factors insofar as existing car design is concerned, such, for instance, as housing clearance, turning radius, brake mechanism, etc.

British Benzol Industry Strengthened

THE demand for benzol in England has grown during each of the past ten years. The country is capable of providing enough benzol to meet home demands, and not more than three years ago the National Benzol Association was inaugurated for the purpose of bringing together those concerned in the production of British benzol, both crude and refined, in order that common action might be taken to protect the future common interests of the manufacturers.

By the formation of this Association—which is in accord with the reconstruction policy of the Government, whose desire it is that every home industry should be represented by one authoritative organization—the benzol industry is strengthened in securing legislation for the encouragement and promotion of its interests.

It is the aim of the Association to popularize the use of this product as a motor vehicle fuel, and it insists that all the benzol used for this purpose shall be universally known as up to "N. B. A. specification."

The problem of creating an effective scheme for distribution did not come directly within the province of the Association, since the marketing and transportation were a commercial proposition entailing large and extensive capital expenditure. Due to the energies of the association, however, the National Benzol Co., Ltd., was formed in March, 1919, as a distinctly separate organization for the marketing of "National" benzol. The association works in entire harmony and concord with the company, but it is, and always will remain, an entirely separate and independent body working in the interests of the whole of the British benzol industry, and not to the advantage of one section in particular.

"National" benzol was for a long while extensively advertised in the motoring press, and was very much in demand, but owing to the popular practice being that of mixing gasoline with benzol, research was conducted to secure a scientifically blended mixture, and after many months of experimentation a fuel containing 50 per cent "National" benzol and 50 per cent gasoline, said to be scientifically mixed to avoid separation, was introduced.

To arrange effectively for gasoline supplies, the National Benzol Co. entered into a working arrangement with the Agwi Petroleum Corp. in the early part of last year, and now the crude oil is British refined at large refineries at Southampton. This is claimed to be the most modern and complete refinery in England, occupying over a square mile of water frontage. The majority of the blending takes place there, and it is one of the large central distributing depots of the company.

As a result of this organization concerned with benzol production and distribution, motorists are now able to obtain in almost any part of the country either benzol or a benzol mixture upon which they can depend. Previously they either could not obtain benzol except in a few big centers, or else only at considerable risk of buying a fuel containing constituents which had harmful effect upon the engine. One never hears complaints now, as happened before the war, of benzol contaminating lubricating oil, burning the valves or corroding the fuel tank.

Suggest Tire Clearance Standards

A SUGGESTION of the American Chain Co. that the clearance between tires and fenders be standardized has been referred to the members of the Passenger Car Division of the Society of Automotive Engineers' Standards Committee for study.

In making this suggestion, J. R. Rayburn of the American Chain Co. stated that "it would seem of prime importance to provide a minimum clearance behind and ahead of the tires in a horizontal direction, preferably 3 in. The vertical clearance above the tires depends upon the extent of the spring action.

"We have found fender braces over tires free to contact with the tire on extreme spring compression. When this happens with chains attached, either the chains or the fender bracket must fail."

PRICES of tires have declined considerably in Rosario, Argentina, in the last six months. List prices are lower and discounts are greater. For example, the Dunlop company reduced list prices from 10 to 15 per cent in their September price list.

Last August a trade discount of 25 per cent was the rule. At present the discount to dealers is generally 25 per cent plus 10 per cent. Competition is overdone and the local market demoralized, there being some sixteen brands offered. The German Continental is now in strong hands and is offering competition. American made tires continue to dominate the market.

Even Torque and Lack of Vibration Characterize Vertical Eight

Crank throws must be 90 deg. apart and crankpins equally spaced from end of shaft must have common axis to avoid rocking couple. Type with five main bearings has advantage from manufacturing standpoint. Inertia forces are balanced.

By P. M. Heldt

NEW developments in eight-in-line engines probably will take place in the United States within a few months. Considerable engineering interest centers at present around the design of this type of engine. Uniformity of torque, balance of reciprocating parts, and other factors are being discussed with renewed vigor.

P. M. Heldt presents a clear, detailed analysis of these points in the accompanying article. He has been a careful student of engine design since the beginning of the automobile industry and his comments on this current topic carry with them the weight of authority as well as interest.

WHEN the passenger car industry first progressed to engines with as many as eight cylinders, these engines were invariably built in V-form. This construction had a number of obvious advantages. It gave equally spaced explosions with a very simple form of crankshaft—exactly the same as the conventional four-cylinder crankshaft—and it gave a very short engine. Consequently the crankcase was relatively light. The chief disadvantage of the eight-cylinder 90 deg. V-engine, that it produces an unbalanced reciprocating force transversely in a horizontal plane, seems to have been unknown to its early champions, for the writer remembers the most prominent manufacturers of this type of engine claiming in their early literature that it was perfectly balanced.

Of late years two other types of eight-cylinder engine have come into vogue, the 60 deg. V- and the all-in-line, or what may more conveniently be called the eight-cylinder vertical. The latter, especially, has achieved quite a degree of popularity in Europe, and has been very prominent in races the last few years. Some leading American manufacturers are now turning their attention to this type. It is of interest at this time, therefore, to investigate the characteristics of this engine, concerning which little or nothing has previously appeared in the automobile press.

Why Multiple Cylinders?

There are two main reasons why the engines of passenger cars are built with a multiplicity of cylinders instead of only one or two. The first is that we want the uniformity of torque which comes from closely spaced explosions or overlapping power strokes. The second is that we wish to eliminate the unbalanced inertia forces due to the reciprocating parts, which, with a single-cylinder or two-cylinder engine, are a cause of severe car vibration. Therefore, in judging any new engine type two important problems to investigate are:

1. How nearly uniform is the torque impressed on the crankshaft; how smooth a torque curve does it produce?

2. Are the reciprocating parts completely balanced; how near does the engine come to this ideal?

It is obvious that with evenly spaced explosions the engine torque becomes more nearly uniform the greater the number of cylinders. In the four-cylinder engine there is still a reversal of torque on the crankshaft once for each explosion. That is, during the early part of each power stroke, instead of the pistons turning the crankshaft around, the crankshaft must drag the pistons along, the power for this dragging action coming from the flywheel. The six is the engine with the smallest number of cylinders in which the torque on the crankshaft is continuous, in which the power strokes overlap, and in which the turning effort on the crankshaft of one piston begins before that of the previous one ends. In an eight-cylinder engine there is still more overlapping of the power strokes and, therefore, still more nearly uniform torque.

Increased Constancy of Torque

Since in both the eight-cylinder 90-degree V and the eight-cylinder vertical engine the explosions follow one another at intervals of 90 deg. and the inertia forces bear the same time relations to the explosions, the torque curve for the vertical engine is exactly the same as that for the 90 deg. V. In Fig. 1 are shown, superimposed, the full load, full speed torque curves of four, six and eight cylinder vertical engines. It will be seen that the torque on the crankshaft becomes more nearly uniform as the number of cylinders increases. While the torque is here plotted for high engine speeds, overlapping of the power strokes and constancy of torque are, of course, most valuable when the engine is pulling hard at low speed.

The other question to be investigated Is that of the balance of the reciprocating parts. These parts, if unbalanced, can produce a reciprocating or rotating force in a plane perpendicular to the crankshaft axis or a rocking couple in a vertical plane (for a vertical engine) through the crankshaft axis. The reciprocating force may be either vertical, in which case it tends to vibrate the chassis

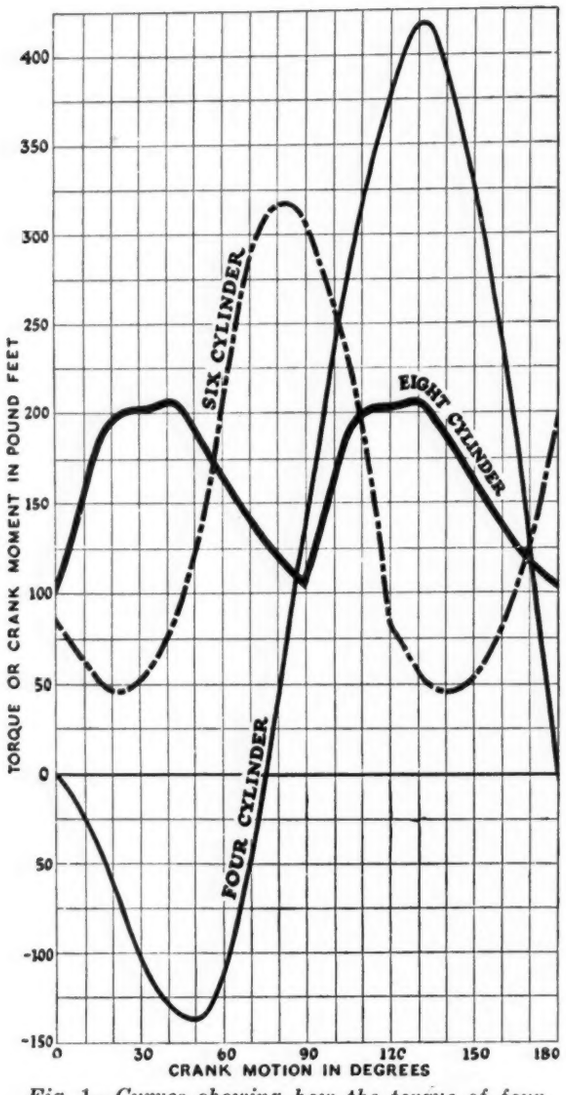


Fig. 1—Curves showing how the torque of four, six and eight-cylinder vertical engines varies during a half revolution of the crankshaft. The other half of the revolution is marked by an identical variation

in a vertical direction, or horizontal, in which case it tends to throw the chassis from side to side. The rocking couple tends to lift one end of the chassis and simultaneously depress the other end, the lifting and depressing actions being rapidly reversed, so that a see-sawing effect is produced on the engine and the chassis.

Besides uniformity of torque and balance of reciprocating parts there is one other feature the engineer looks for in a new engine type, and that is uniform spacing of explosions. In an eight-cylinder engine, since there are eight explosions during two crankshaft revolutions, or 720 deg. of crankshaft motion, the explosions come 90 deg. of crank motion apart, and since the cylinder axes are all in the same plane the crank throws must be at 90 deg. with one another. This is one of the conditions to be observed in the design of the crankshaft.

Balancing Inertia Forces

Another condition arises from the fact that, as already explained, rocking couples in the longitudinal plane must be avoided. This necessitates that the resultant of the inertia forces of all reciprocating parts moving upward at any instant be equal, opposite in direction and *in line with* the inertia forces due to the reciprocating parts moving downward at the same instant. This last condition, that the resultants of the upward and downward inertia forces respectively, be at all times in line with each other, can only be satisfied if these resultants pass through the middle point of the crankshaft. This can be insured by placing the two end crankpins (Nos. 1 and 8) in line; also Nos. 2 and 7, 3 and 6, and 4 and 5, respectively.

These, then, are the two rules for the design of crankshafts for eight-cylinder vertical engine, that the crank throws must be at 90 deg. with one another, and that crankpins equally spaced from opposite ends of the crankshaft, respectively, must be in line with each other. This will insure equally timed explosions and the absence of a rocking couple in the longitudinal vertical plane. The matter of reciprocating or rotating inertia forces will be dealt with later on.

Faults in Crankshaft Design

In the past a form of crankshaft consisting virtually of two four-cylinder crankshafts joined end to end, the two being placed at right angles to each other (Fig. 2) has been much used for eight-cylinder vertical engines. It is apparent that this design does not meet the second requirement, that pairs of crankpins equally spaced from opposite ends of the crankshaft, respectively, must be in line with each other. There is, therefore, a rocking couple in a longitudinal plane in such an engine. This can also be proved in another way. Such an engine consists really of two four-cylinder engines joined end to end. We know that in a four-cylinder engine the secondary inertia forces, which have twice the period of crankshaft revolution, are uncompensated. Each half of the eight-cylinder vertical engine, therefore, is subjected to this secondary inertia force, and since the halves of the crank are set 90 deg. or one-quarter of a revolution apart (which corresponds to one-half the period of the secondary unbalanced force) the unbalanced forces on the halves of the crankshaft at any moment will be in opposite directions and the rocking couple, therefore, will be a maximum.

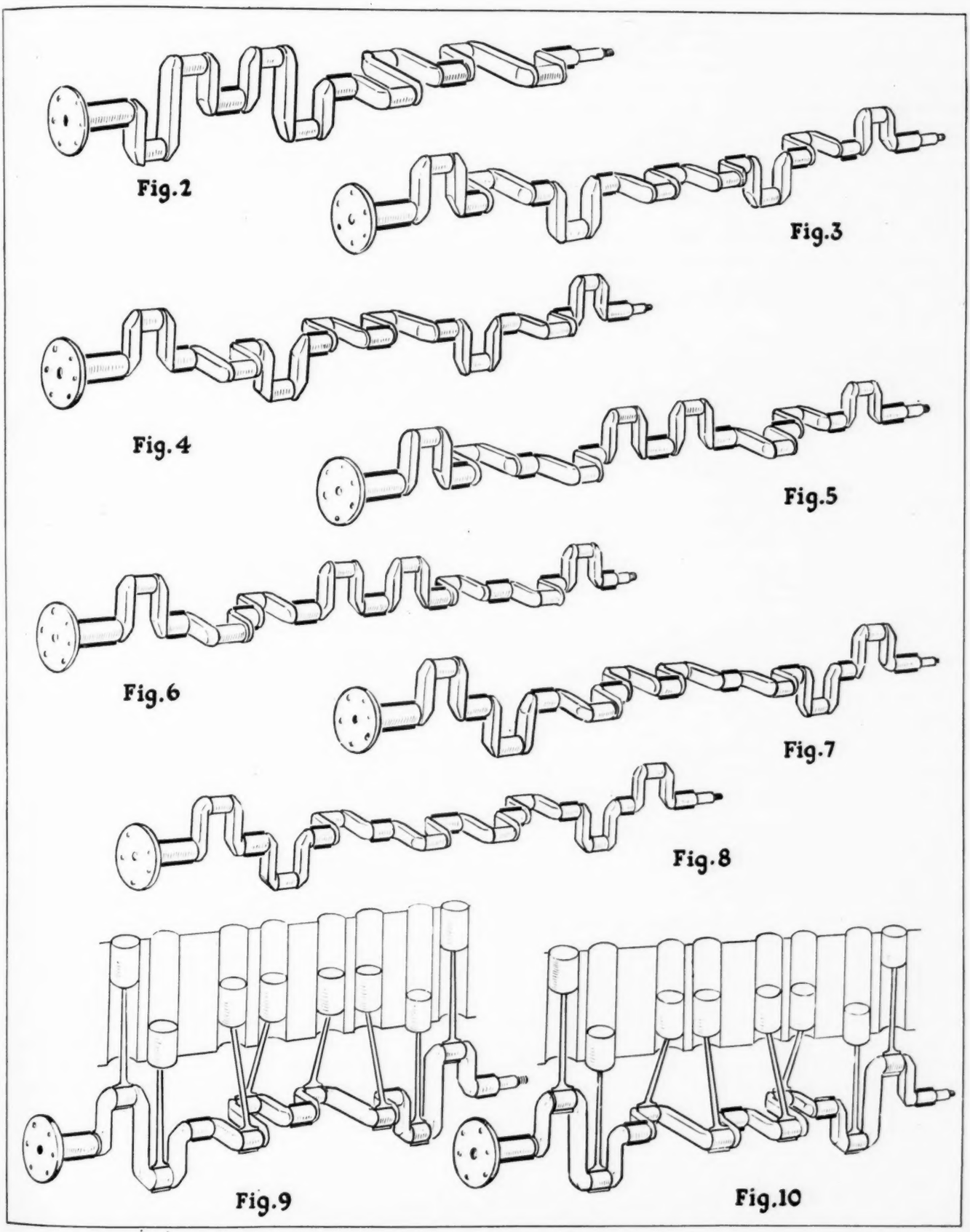
From the two rules for the design of crankshafts for eight-cylinder vertical engines given above, it is easy to work out a number of designs that will give equally spaced explosions and no rocking couple. The following seem to cover all possible layouts:

	0 deg.	90 deg.	180 deg.	270 deg.
Fig. 3.....	1—8	4—5	3—6	2—7
Fig. 4.....	1—8	2—7	3—6	4—5
Fig. 5.....	1—8	3—6	4—5	2—7
Fig. 6.....	1—8	2—7	4—5	3—6
Fig. 7.....	1—8	3—6	2—7	4—5
Fig. 8.....	1—8	4—5	2—7	3—6

The various designs Figs. 3 to 8 will give exactly equal results as regards spacing of explosions and balance of reciprocating parts. We can, therefore, choose among them on the basis of facility of manufacture. At first sight there would not seem much to choose on this basis, as all have the same number of throws and all have throws in two planes at right angles to each other. However, there is a difference, and a difference that counts, as will be seen by the following:

Eight-throw crankshafts in the first place, are usually forged flat, that is, with all throws in the same plane. Then, to get one or more throws into a plane at right angles thereto, one of the main journals is brought up to red heat and given a twist of 90 deg. Now, it will be seen by referring to Fig. 2, that this design of crankshaft, which was condemned because it does not get rid of the rocking couple, needs to have only one of its main journals twisted in this manner. Designs shown in Figs. 3 and 4 require six of their main journals to be twisted through 90 deg.; designs Figs. 5 and 6, four, and designs

Forms of Crankshafts for Use in Eight-Cylinder Vertical Engines



Figs. 2 to 10—Diagrams showing various forms of crankshaft which can be used in eight-cylinder vertical engines. The shafts shown in Figs. 9 and 10 combine good balance with relative ease of manufacture

Figs. 7 and 8 only two. It is, therefore, natural to choose one or the other of these two latter designs.

There is another aspect to this problem. With designs shown in Figs. 3 and 4 it would evidently be necessary to have main bearings, or at least journals, between each pair of adjacent crankthrows, in addition to the end journals, making either eight or nine main bearings, according to whether or not one is used between the two middle throws. But in an eight-cylinder passengar car engine the individual cylinders, and hence the explosion and inertia forces, are so small as to make this very undesirable. In Figs. 3 to 8 main bearings are shown between each pair of adjacent crankthrows, but in an actual crankshaft of the forms of Figs. 7 and 8 only five main bearings would be used and the cranks would have the form shown in Figs. 9 and 10.

It now remains to investigate whether or not the forces due to the inertia of the reciprocating weights in the individual cylinders are balanced. The reciprocating force due to the parts in a single cylinder may be represented by the equation,

$$F = a\ (\cos \Theta + b \cos 2\Theta)$$

in which Θ is the angle the crank has moved from the top dead center position and a and b are constants. For the two cylinders corresponding to crankthrows 1 and 8 (Fig. 10) the inertia force may therefore be represented by

$$F = 2\,a\ (\cos \Theta + b \cos 2\Theta)$$

For cylinders 4 and 5 the force then is

$$2\,a\ [\cos\ (\Theta + 90) + b \cos\ 2\ (\Theta + 90)]\,;$$

for cylinders 2 and 7

$$2\,a\ [(\cos \Theta + 180) + b \cos 2\ (\Theta + 180)]$$

and for cylinders 3 and 6

$$2\,a\ [\cos\ (\Theta + 270) + b \cos 2\ (\Theta + 270)]$$

The resultant is equal to the sum of these items, namely:

$$F_r = 2\,a \left\{ \cos \Theta + \cos\ (\Theta + 90) + \cos\ (\Theta + 180) + \cos\ (\Theta + 270) + b\ [\cos 2\,\Theta + \cos\ (2\,\Theta + 180) + \cos\ (2\,\Theta + 360) + \cos\ (2\,\Theta + 540)] \right\}$$

Now, remembering that $\cos \Theta = -\cos\ (\Theta + 180)$ we see that in the first part of the equation terms 1 and 3 and terms 2 and 4 cancel out, respectively, and in the second part, terms 1 and 2 and terms 3 and 4, respectively. Hence F_r is equal to zero; that is, all inertia forces are balanced out. Therefore, as far as balance of the reciprocating parts is concerned, the eight-cylinder vertical engine is equal to the six-cylinder vertical and twelve-cylinder V-type, and superior to the eight-cylinder V-engine.

Glucose Anti-Freeze Action Unreliable

RECENT press communications have suggested the use of glucose as a satisfactory non-corrosive anti-freeze mixture with water in the radiators of automobiles.

According to the Bureau of Standards glucose solutions are by no means anti-freeze in the ordinary sense, that is of remaining liquid at temperatures considerably below 32 deg. Fahr., although they have anti-freeze value to the extent that they may avoid the likelihood of bursting radiators upon exposure to temperatures below the freezing point of water.

Any strength of glucose solution which can be made will freeze, and freeze solid, at a temperature but very few degrees below the freezing point of water. Exact figures are quoted below. The process of freezing is gradual, a slush forming which thickens continually as heat is abstracted.

Evidence is strong that, under radiator conditions, the slush stage may be relied upon to continue beyond the period of marked volume changes incident to freezing, hence there will be no confined pressures and so no danger from bursting.

But bursting is not the only damage inflicted upon an automobile engine cooling system by a freeze up. Total stoppage of the water circulation may have serious effects upon the pump if there be one in the water line, and the engine may overheat severely shortly after starting, with the consequent formation of steam at considerable pressure and the blowing out of gaskets and connections. Blowing out of water through the overflow is practically certain.

So far as the freezing point of its water solution is concerned, the active part of commercial glucose is dextrose. This is usually about 35 per cent of the whole, the remaining two-thirds of glucose being mainly dextrins and water, which are inert in respect to any effect on freezing point. Accordingly a 30 per cent solution of glucose in water is approximately a 10 per cent concentration of dextrose in water. This solution freezes at 30 deg. Fahr. and a 20 per cent solution of dextrose has a freezing point 27 deg. Fahr. A 20 per cent solution of commercial glucose, not being wholly dextrose would be expected to freeze still closer to 32 deg. Fahr., and some approximate measurements made upon a solution of this strength showed 30 deg. Fahr. for the formation of ice crystals. This determination was probably correct within 3 deg. Fahr.

Freezing Points of Dextrose-Water

Approximate values to 1 deg. Fahr.

Per cent concentration by weight (in terms of anhydrous dextrose).....	10	20	30
Freezing point (approx.) (deg. Fahr.)	+30	+27	+23

No proportion of dextrose and water up to saturation can be found which does not freeze at a temperature above 23 deg. Fahr.

The freezing of the liquid in an automobile radiator is a very slow process under ordinary conditions because these are usually not such as to abstract heat very rapidly and the latent heat of freezing of water is very large. After cooling a given quantity of water to 32 deg. Fahr., there must be a further extraction of heat from it in order to secure a like mass of ice at 32 deg. Fahr., just as much heat as the water gave up in cooling from 175 deg. Fahr. to 32 deg. Fahr. With an automobile standing still and its fan not running, nor any wind blowing, the air circulating around the radiator surface from natural convection and occasional puffs of breeze will not abstract heat at any very rapid rate even though the weather be as much as 20 or 30 deg. colder than the radiator. Accordingly with slush formation providing protection from bursting during the early stages of freezing, it is highly probable that many hours of exposure to quite cold weather can be withstood safely.

Perhaps the principal danger in using a glucose solution lurks in the total uncertainty as to degree of protection, in marked contrast to the absolute certainty of behavior of an alcohol water mixture of the usual composition.

No Gasoline Substitute in Sight, Petroleum Chemists Say

While nothing has been found to take its place, absolute alcohol, which is readily miscible with gasoline, has proved a good blending agent. Value of anti-knocks is recognized. General Motors is now marketing doped fuel called Ethyl Gas.

GASOLINE substitutes and so-called "dopes" were among the most important subjects considered at the joint session of the Gas and Fuel Section of the American Chemical Society held in New Haven, Conn., on April 6. The speakers appeared to realize fully that none of the substitute fuels now in sight can be expected to add materially to the motor fuel supply of this country, but it is appreciated that some fuel blends and some doped fuels are apt to have considerable influence upon the fuel market, as well as upon the future design of engines in which these fuels are used.

It was learned during the meeting that the General Motors Co. is now marketing under the name Ethyl Gas a fuel containing the most effective dope or knock deterrent which has been developed by that organization. This fuel is at present being sold at only one filling station in Dayton, Ohio, but it is planned to market it more extensively in the near future. Ethyl Gas as now marketed consists of ordinary commercial gasoline, approximately satisfying the Government specifications, to which is added in the proportion of 5 c.c. per gal. an anti-knock substance consisting chiefly of tetra ethyl lead. In this proportion the dope is said to be an effective knock preventive on all ordinary engines with the present average compression ratio, and which now give trouble from knocking. In the case of an engine which does not knock with present-day gasoline the use of the dope fuel renders permissible an increase of about 15 per cent in the compression pressure. It is understood that some slight difficulties which originally were occasioned by the use of tetra ethyl lead as a fuel dope have now been entirely overcome by the addition of one other ingredient.

Fuel Requirements Raise Discussion

Little if any information which is entirely new was contained in the papers presented before the Gas and Fuel Section, but some interesting points which are worthy of further consideration were raised in the papers and the discussion which followed them. The papers of greatest interest to automotive engineers were undoubtedly those presented by S. W. Sparrow of the Bureau of Standards, and by H. A. Gardner of the Institute of Industrial Research. Sparrow's paper entitled: "Fuel Requirements of Internal Combustion Engines," discussed fuel from the standpoint of availability, usability and power producing ability. Special attention was directed to the meaning and importance of explosive range, distillation range, latent heat of vaporization, flash, freezing and separation points, viscosity, detonation characteristics, spontaneous ignition temperatures and corrosive action.

Sparrow called attention to the extreme difficulty involved in using first one fuel and then another of different characteristics. Fuels which enable the use of high compression ratios give good economy while others become almost unusable because of violent detonation under the same conditions.

Under the head of distillation range, Sparrow said that the starting characteristics of the fuel are dependent largely upon the temperature at which the first five or ten per cent is distilled. Since the air to fuel ratio furnished the engine for starting depends upon the amount of fuel that is actually vaporized under starting conditions, it is apparent that if only five per cent of the fuel is vaporized the total fuel content of the charge must be twice as great as where 10 per cent is vaporized, hence the probable dilution of the lubricant which is brought about by the unconsumed excess of fuel is much greater.

High Anti-Knock Value Desirable

The time element as well as the temperature to which the fuel is subjected must of course be given careful consideration in relation to vaporization of the fuel. On account of the difficulty of supplying heat for vaporization, Sparrow considers that a low heat of vaporization is a desirable characteristic of the fuel.

In the case of blended fuels the temperature at which separation occurs is an important factor.

High anti-knock value is desirable even if the fuel is to be used in engines which can be operated satisfactorily with fuel of much lower anti-knock value because detonation tends to increase with the accumulation of carbon in the cylinder. When the detonation reaches a certain degree of severity, the carbon must be removed. The greater the anti-knock value of the fuel the greater can be the deposit of carbon before detonation becomes so severe as to necessitate carbon removal. Hence an increased anti-knock value makes it necessary to remove carbon less frequently.

A low spontaneous ignition temperature is undesirable if the fuel is to be used in a constant volume type of engine, for it increases the liability to pre-ignition and pre-ignition causes overheating and loss of power. In the case of Diesel type engines, however, a low spontaneous temperature is desirable.

The presence of water or sulphur in the fuel is especially undesirable from the standpoint of corrosion.

In the discussion of the Sparrow paper, it was brought out that deposits of carbon tend to increase detonation chiefly because of the fact that they act as heat insulators. Thomas Midgley, Jr., stated that a deposit of lime on the outside of the cylinder wall has substantially the same effect as a coating of carbon inside; in both cases, the deposit tends to prevent the escape of heat from the cylinder and detonation is more apt to result.

In reply to a question concerning the use of a catalytic coating on the surfaces of the combustion chamber, Midgley said that in his experience such coatings have no effect

other than that which results from a similar coating of carbon.

The paper by H. A. Gardner dealt chiefly with the use of absolute alcohol as one constituent of fuel suited especially for use in aviation engines. Gardner stated that interest in this subject had been aroused by recent developments which make it possible to produce absolute alcohol at a much lower cost than formerly. He stated that this grade of alcohol is completely miscible with gasoline in all proportions and at all temperatures.

Gasoline Must Be Sulphur Free

It appeared that a test made by the Navy Department on aviation engines using a mixture containing 30 per cent absolute alcohol and 70 per cent aviation gasoline has proved this mixture to be quite satisfactory fuel providing proper care is used in the refining of both products. In the proportion mentioned, it is said that alcohol had proved to be a better anti-knock than benzol. Its use also tends to reduce carbon deposits. The gasoline must, however, be free from sulphur and water in order to prevent corrosion. An aluminum tank has proved better than one made from either copper or terne plate providing water is absent in the fuel.

In the discussion of this paper it was stated that the use of as little as 10 per cent of absolute alcohol would have relatively little effect in tending to suppress the knock. Midgley said, however, that a mixture of 30 per cent absolute alcohol and 70 per cent aviation gasoline would be slightly better in its knock-reducing quality to a mixture containing 40 per cent benzol and 60 per cent gasoline.

Of the other papers presented that by F. W. Lane and A. V. Bower on the Economic Aspects of Motor Fuel Supply from Petroleum, created the most discussion although this paper contained relatively little that has not been repeatedly printed elsewhere. It was indicated that alcohol and benzol are never apt to be large factors in the motor fuel supply market, except perhaps as blending agents with other fuels. Lane stated that the excess of sulphur which is often contained in benzol, marketed as motor fuel in the past, is now being eliminated through more careful refining which renders this fuel sulphur free. It was indicated that shale oil is apt to become the future reliance for motor fuel supplies in this country, but this source cannot hope to compete with petroleum as long as the supply of the latter remains adequate for present automotive and industrial needs.

R. E. Wilson of the Standard Oil Co. of Indiana, questioned Lane's statement to the effect that the cracking of gasoline is not sound economically, on account of the heat lost in this process. Wilson stated that this heat is usually obtained from coal or from liquid fuel which is not suitable for other purposes and that cracking has proved its worth as an economic factor in the industry.

Use Trucks for Short Hauls and Release Freight Cars

"THE time has come when the nation's railroad facilities are so heavily taxed by the enormous tonnage offered that there is only one way in which we may get freight hauled, and that is by asking business men to employ motor trucks for the short hauls, say, up to thirty miles or so, thus releasing railroad facilities and equipment for the longer haul which can go by no other means."

This statement was made by T. C. Powell, vice-president of the Erie Railroad Co., in charge of traffic, in a recent interview regarding transportation problems.

Some freight, he said, has to be hauled so far that it must go by rail, but other freight for short hauls can be shipped by motor truck and it is cheaper for the shipper and consumer to have it go that way. He developed this idea as follows:

"In these days the cost of handling in railway terminals, especially in the terminals of the larger cities, it is so great that, after you have paid the freight to the railroad and the trucking costs in the originating and destination terminals, the aggregate cost is more than it is when, for the short distance, you load your freight on the motor truck and have it hauled direct.

Truck Not a Railroad Competitor

"In fact all who have kept up with our modern transportation problems admit that the motor truck is the necessary adjunct, and not the competitor of the railroad, indispensable to economic short hauling.

"The problem just now is to get the people to think straight and in scientific terms of the proper function of the motor truck. It is mostly the task of the manufacturers and users of the motor truck. One hears and reads much misinformation on the subject.

"We cannot set down, in every instance, an arbitrary limit to the economic distance for motor truck haulage. Sometime time is the determining element. The economic distance will vary according to local conditions. But it is something like thirty miles by an average rule."

This plea for the use of the motor truck was made by Powell in connection with the problem of putting the "loafing freight car" on the job in order that transportation may be handled with greater efficiency, and not congested by uneconomic use of railroad facilities.

THE volumetric section of the Bureau of Standards has recently prepared a mimeographed circular known as Letter Circular 89, which contains conversion tables for petroleum oils. These tables give the relation between specific gravity, degrees Baumé, and degrees A. P. I. (American Petroleum Institute).

A special hydrometer scale used in connection with petroleum has come into extensive use within the past few years, and there has been much confusion between it and the Baumé scale for light liquids. Originally all oil hydrometers were intended to be graduated in accordance with the relation

$$\text{Deg. Baumé} = \frac{140}{\text{Sp. Grav. 60 deg./60 deg. Fahr.}} - 130$$

Through errors in the early standards of one manufacturer of hydrometers, many instruments made for the oil trade were graduated on a basis slightly different from the above formula and more nearly represented by replacing 140 and 130 in that formula by 141.5 and 131.5, respectively.

These instruments, although in error, came into very wide use, and on account of the confusion resulting from the use of the two scales, both of which were commonly called "Baumé," it was agreed in December, 1921, by the American Petroleum Institute, the Bureau of Mines, and the Bureau of Standards that this scale, based on the modulus 141.5, should be recognized and approved for exclusive use in the oil industry in place of the regular Baumé scale for all liquids lighter than water, and that it should be known and designated as the American Petroleum Institute scale, or A. P. I. scale.

Tests of Liberty Engine Crankshaft Material

Investigation of crankshaft fracture at McCook Field shows good quality secured in present manufacture.

AN investigation of a crankshaft fracture on a Liberty 12 engine was recently made by the Material Section of McCook Field. The steel from which the crankshaft was forged was 30-point carbon, medium chromium (S. A. E. steel No. 3435) of good quality and properly heat treated to meet the requirements of Air Service specifications. According to the findings, the failure of the shaft was not attributable to the qualities of the steel, but probably was due to the fact that first of all a part of the propeller broke off, gouging out the front main bearing and causing the imposition at the next main bearing of an additional bending moment of such magnitude as to cause rupture in the cheek nearer the propeller end.

The location of the fracture and twisting of the connecting rod are shown in Fig. 1. The physical and chemical tests of the shaft, given herewith, give a good idea of the quality of these shafts as they are now being manufactured. The metallographic sections were longitudinal, and the etching reagent was a saturated solution of picric acid in alcohol to which had been added a few drops of concentrated nitric acid.

The chemical analysis of the shaft material follows:

Carbon	0.36	Nickel	3.00
Manganese	0.59	Chromium	0.75
Sulphur	0.043	Vanadium	Nil
Phosphorus less than	0.030		

The appended is a tabulation of the results obtained by the physical testing branch:

Tensile Test

Yield point, lb. per sq. in.	120.900
Ultimate strength. lb. per sq. in.	133.200
Elongation, % in 1.5 in.	21.3
Reduction of area, per cent	65.6
Location of fracture	M.T.
Character of fracture	Star

Impact and Hardness Test

Impact, Specimen No.	1–1	1–2	1–3
Width, in.	.393	.389	.392
Thick, in.	.201	.208	.208
Angle, deg.	.128	.125	.123
Ft. lb.	36.74	44.99	44.99
Rockwell (1/16 in. ball)	75	76	74
Brinell	266	262	255

Photography and Metallography

The surface of the forging showed a few hair-line seams, but these were considered as of minor importance.

Fig. 1—Showing location of fracture and twisting of connecting rod on Liberty 12 engine

The distribution of inclusions was good, and, as far as could be ascertained, the forging flow-lines were normal.

The physical properties were well within the requirements of A. S. specification No. 10,254, which follow:

Ultimate strength (min.), lb. per sq. in.	130,000
Yield point (min.), lb. per sq. in.	115,000
Elongation (min.), per cent in 2 in.	17
Reduction of area, per cent	50

Impact values on another shaft of the same analysis, which also met the tensile requirements tabulated above, ranged from 22 to 35 ft. lb., so that the impact resistance of the steel in this Liberty 12 shaft may be regarded as exceptionally good. The hardness values were normal. Metallographic examination showed that the steel was properly heat treated. Fig. 3 shows one of a few large but inconsequential particles of manganese sulphide.

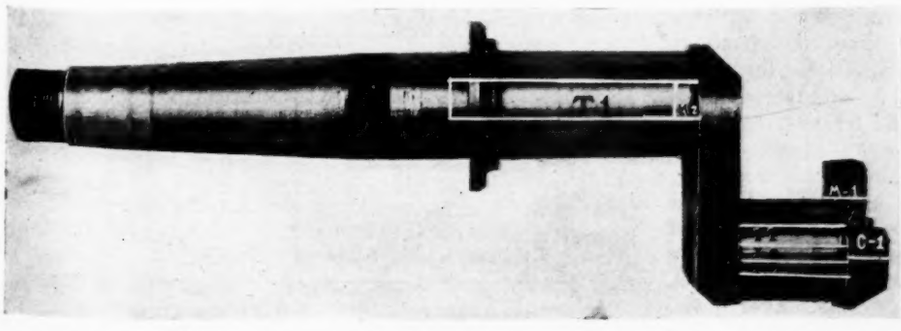


Fig. 2—Showing where tension, impact, metallographic and chemical samples were taken from

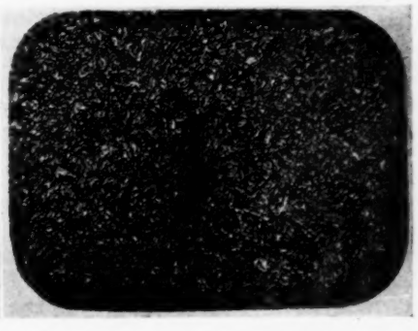


Fig. 3—Micro-photograph showing manganese sulphide inclusion in troosto-sorbitic matrix

Increase in Cam Tip Radius Effects Reduction in Inertia Forces

Investigation shows possible errors in use of straight-line motion analyses for valves operated by rocker arms. Effect of any slight modification in cam contour upon valve action curves impossible to predict. Important conclusions drawn.

By Glenn D. Angle
In charge of engine design, Engineering Division, Air Service

IT is proposed in this article to direct attention to the possible errors resulting from the use of straight-line motion analyses for valves that are operated by means of rocker arms. Actual valve lift and velocity curves, together with actual and computed acceleration and inertia force curves, are shown for three typical rocker-arm mechanisms in order to effectively compare these resulting variations. Before proceeding with this discussion, however, we should briefly consider the simple analytical methods employed in the investigation of valve motions and thus define the terms to which we must refer.

The lift curve shows the distance (in inches) that the valve is lifted from its seat at any angular position of the cam. The area enclosed by the lift curve and the line of clearance is a measure of the filling capacity of a valve of any given diameter; hence, it is desirable to obtain a lift diagram giving the greatest permissible area for any given set of speed and load conditions.

The intersections of the lift curve and clearance line are the theoretical opening and closing points of the valve;

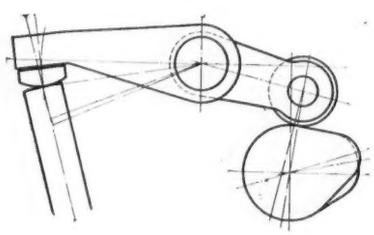


Fig. 1—Diagram of Liberty valve rocker arm mechanism

the actual height of the clearance line, as well as the angular distance on the cam during which the valve is lifted, depends upon the degree of expansion due to heat that exists during operation. As a matter of completeness, the lift curve should always be constructed with the base circle of the cam as a base.

The tangential cam, which is the type considered in this investigation, requires different equations for determining the lift when the follower is in contact with the arc at the tip of the cam than when the follower is on the tangential side. The slope of the tangential side of the cam, with respect to the center line of the cam at maximum lift, determines the duration of cam opening; while the maximum lift, together with the tip radius and period of dwell at this particular lift, determines the mean valve opening. With two cams of identical timing and lift, the one having the smaller tip radius and longer dwell at full lift will show the highest average opening. The dynamics of the mechanism, however, dictate these limits.

The velocity curve, for any given number of revolutions per minute of the camshaft, shows the speed of the valve (ft. per sec.) at various cam positions. The velocity rises from zero, at the point of valve opening, to a maximum; and then decreases to zero again at the position of full lift. These periods of rise and fall in velocity, which are sometimes denoted lower and upper motion, are repeated on the closing side of the cam in the reverse order. Aside from the indicated meaning of the velocity curve slopes, the most important consideration is the velocity of the valve at the opening and closing points, particularly the latter, on account of the shock to the valve mechanism and valve seat by high momentum.

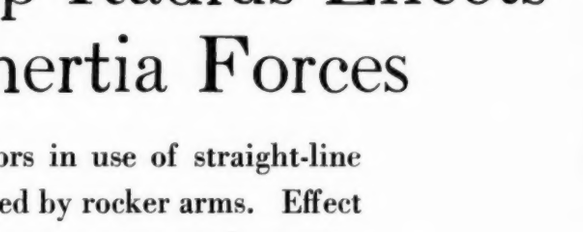


Fig. 2—Actual lift and velocity curves of Liberty inlet valve (2000 r.p.m.) (1—L.H. cyl., 2—R.H. cyl.)

The acceleration or rate of change in velocity (ft. per sec. per sec.) is computed for all cam shapes by a two-fold differentiation of the lift equation with respect to time. It is apparent that the acceleration of the valve depends upon the speed of the camshaft and the cam shape.

The product of acceleration and the mass of the reciprocating valve components (including one-half the mass of the valve spring) represents an inertia force that must be controlled by the spring force during the upper motion

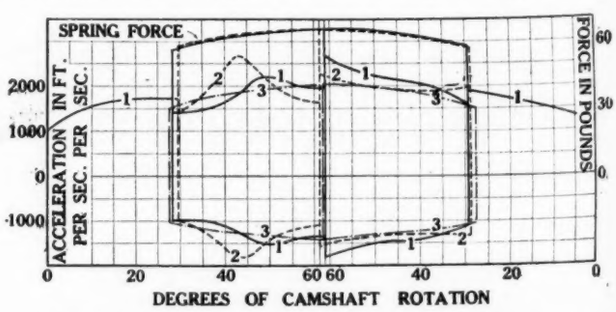


Fig. 3—Acceleration, spring and inertia force diagrams of Liberty inlet valve (2000 r.p.m.) (1—L.H. cyl., 2—R.H. cyl., 3—computed values)

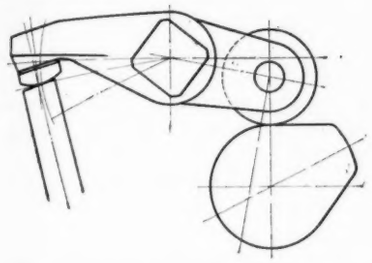


Fig. 4—Diagram of rocker arm mechanism of engineering division, Air Service, Model W-1-A engine

of both opening and closing periods. The spring force must also exceed this inertia force by the amount necessary to overcome the friction in the mechanism. A common practice is to assume approximately 20 per cent increase in load due to friction; but the amount actually required, of course, depends upon the design of the valve mechanism.

It is desirable to keep the inertia forces of the valve within reasonable limits, otherwise the required spring forces become high and impose severe strains on the driving mechanism and various parts of the valve gear. In case the spring forces are not sufficient, the follower leaves the cam and returns with a blow that induces high periodic vibrations in the spring which may cause its failure. Sometimes the acceleration can be materally reduced by a slight change in cam tip radii.

The actual motion of valves operated by means of rocker arms is quite different from the straight-line motion investigated by the usual mathematical analysis. The methods described above, therefore, cannot be applied in computing the true values of the valve action curves for rocker arm mechanisms. In the following discussion with regard to the actual valve action of the three typical rocker arm mechanisms, the effect of change in cam tip radius will also be treated under this method of operation.

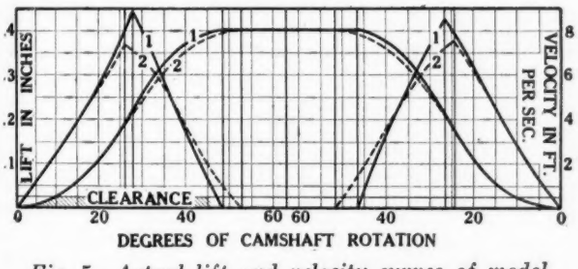


Fig. 5—Actual lift and velocity curves of model W-1-A inlet valve (2000 r.p.m.) (1—⅛-in. rad. cam, 2—¼-in. rad. cam)

A diagram of the rocker arm valve mechanism of the Liberty engine, the first design to be considered, is shown by Fig. 1. Attention is directed to the fact that in this valve gear deviation from true straight-line motion is at a minimum (for this length of arm) since a line tangent to the path of the follower and at right angles to a line drawn through the centers of the rocker fulcrum and cam follower passes through the center of the cam. The variation between the action of the valves in the left and right hand cylinders, which are shown in Figs. 2 to 5, inclusive, are due to differences in position of the valves with respect to the direction of camshaft rotation.

From the inlet valve lift curves of Fig. 2, it will be observed that the right hand inlet valve reaches full lift sooner, and the left hand later, than mid-point, or theoretical full-lift position. This is due to the fact that the cam approaches the follower from the side on which its valve is located in the latter case, and from the opposite side in the case of the former. Likewise, the maximum velocity of the inlet valve in the right hand cylinder is greater on the opening side of the cam, and in the left hand cylinder, greater on the closing side of the cam. It will also be observed that the points of maximum velocity are not coincident.

The acceleration, during the lower motion of both opening and closing sides of the cam, is the same for the inlet valves of both left and right hand cylinders (see Fig. 3). The negative accelerations, during the upper motion, vary considerably from each other, and also with respect to the values computed for straight-line motion, which are shown by the dot and dash lines. The maximum deviation from the computed values, occurring during the opening of the inlet valve in the right hand cylinder, is found to be 42 per cent. A maximum deviation of 28.5 per cent also

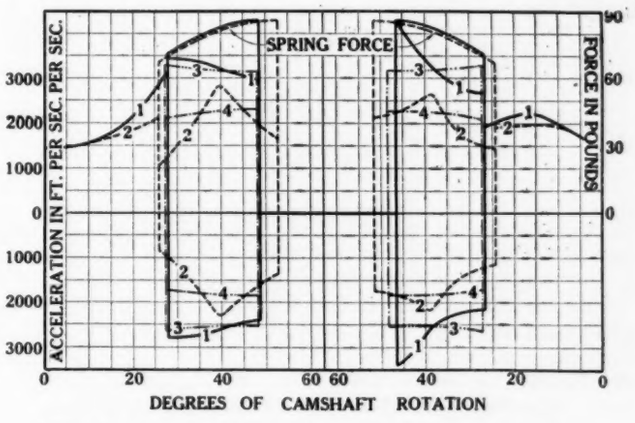


Fig. 6—Acceleration, spring and inertia force diagrams of model W-1-A inlet valve (2000 r.p.m.) (1—⅛-in. rad. cam, 2—¼-in. rad. cam, 3—computed values ⅛-in. rad. cam, 4—computed values ¼-in. rad. cam)

exists on the closing side of the inlet valve in the left hand cylinder.

The actual inertia forces of the inlet valves of both cylinders, and the computed values of the corresponding inertia forces resulting from straight-line motion, together with the spring forces, are shown above the zero line on Fig. 3. Under the most severe conditions, during the opening of the inlet valve in the right hand cylinder, the spring load is sufficient to balance the inertia force and provide about 20 per cent additional force to overcome the friction of the mechanism. A lighter spring would prove inadequate, although the computed values for straight-line motion indicate that one might possibly be used. Rocker arm valve actions are obviously too uncertain, even under the most favorable conditions, to depend upon the usual analysis applied to straight-line motion for accurate results.

The corresponding curves of the Liberty exhaust cam do not have such variable characteristics. The actual accelerations are more consistently in excess of the computed values, but show a maximum variation of only 13.5 per cent. Compared with the inlet curves, the relative position of the right and left hand cylinders with respect

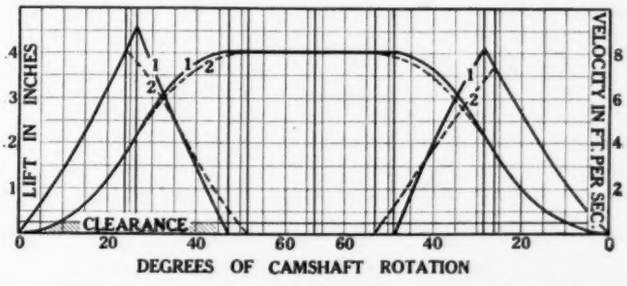


Fig. 7—Actual lift and velocity curves of model W-1-A exhaust valve (2000 r.p.m.) (1—⅛-in. rad. cam, 2—¼-in. rad. cam)

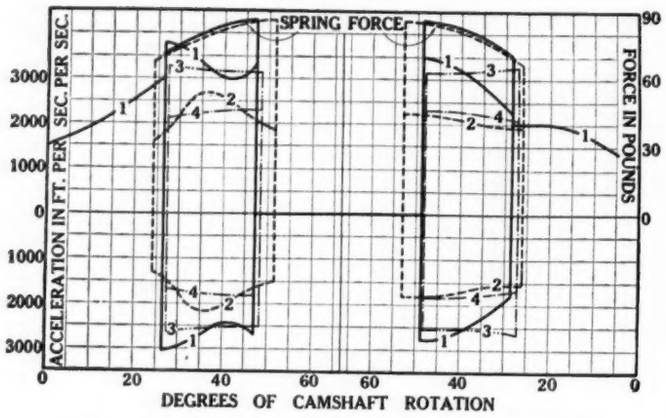


Fig. 8—Actual acceleration, spring and inertia force curve of Model W-1-A exhaust valve (2000 r.p.m.) (1—⅛-in. rad. cam, 2—¼-in. rad. cam, 3—computed values ⅛-in. rad. cam, 4—computed values ¼-in. rad. cam)

to opening points are reversed. This is explained by the fact that the direction of camshaft rotation with reference to the exhaust valve is opposed to that for the inlet.

The second example is the valve mechanism of the Engineering Division, Air Service, Model W-1-A Engine. The cam follower centers for both valves of this engine are located on the cylinder axis (see Fig. 4). Since a line drawn tangent to their paths, and normal to the rocker arm axis falls farther from the center of the cam than in the preceding example, we find the characteristics of the curves even more irregular.

In this example, the two sets of curves show the actual valve action resulting from different cam contours, the solid line representing a cam with a ⅛ in. tip radius and the dotted line one having a radius of ¼ in. The

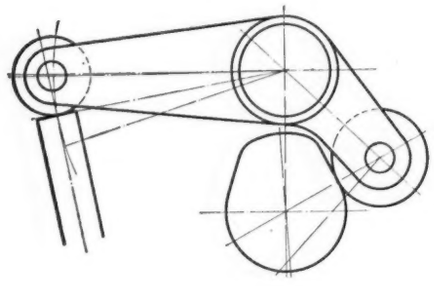


Fig. 9 — Diagram of rocker arm valve mechanism of special air service cylinder

increase in the area of the lift curve, by using the smaller radius, is 2.35 per cent on the inlet and 2.25 per cent on the exhaust. This slight increase is obviously attained at the sacrifice of a rise in velocity and acceleration.

Except for the duration of valve opening period, the corresponding inlet and exhaust cams have identical shapes, and the curves obtained by computing for straight-line motion are, therefore, the same for both in either case. A comparison of the two curves obtained by computing for straight-line motion with different cam tip radii discloses their dissimilarity, one being concave with reference to the zero line, and the other convex. Hence, in a true case of straight-line follower motion, the importance of calculating the accelerations of the valve over its entire opening period is clearly demonstrated, and more particularly when the cam has a small radius at the tip. Whenever the characteristics of the inertia curves are not approximately the same as those of the spring force curves, there is the possibility that the spring force might be exceeded or not prove sufficient to overcome the inertia plus friction.

On Figs. 8 and 10 the double dot and dash curve of computed valves for the ⅛ in. radius cam approaches the spring force curve at the beginning of the upper motion on the opening side, and at the end of the upper motion of the closing side. At these points, the load of the spring is apparently not sufficient to hold a follower, which moves in a straight line, upon the cam; nevertheless, at the beginning and end of full lift, where a single maximum value is ordinarily computed under moderate cam conditions, the spring load is evidently ample.

Due to the respective positions of the valves with reference to the direction of camshaft rotation, the actual corresponding curves of inlet and exhaust valves show widely different characteristics. The most noticeable example is the acceleration during the upper motion on the closing side of both cams having a ⅛ in. radius at the tip. Besides differing widely from each other, these curves, with few exceptions, bear no similarity to the curves obtained by computing for straight-line motion; the maximum deviations of the curves for the cam of ⅛ in. tip radius measure as follows: Inlet opening side, 9 per cent; inlet closing side, 34 per cent; exhaust opening side, 14 per

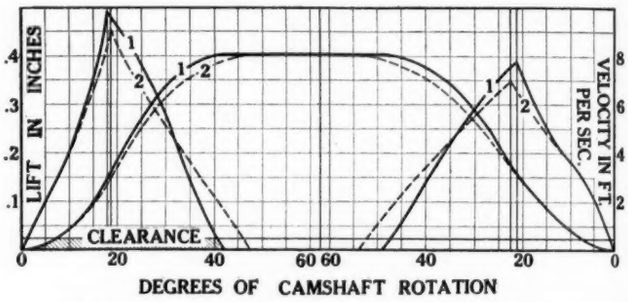


Fig. 10—Actual lift and velocity curves of special cylinder inlet valve (2000 r.p.m.) (1—¼-in. rad. cam, 2—⅜-in. rad. cam)

cent, and exhaust closing side, 10 per cent. Similar deviations measured on the curves for the cam of ¼ in. tip radius are as follows: Inlet opening side, 28 per cent; inlet closing side, 19.5 per cent; exhaust opening side, 20 per cent, and exhaust closing side, 14 per cent.

The third example, shown diagrammatically by Fig. 9, is a valve gear of a water-cooled cylinder of special aluminum-head construction being developed by the Engineering Division, Air Service. In this design, the inlet and exhaust rocker arms have a common fulcrum located on the axis of the cylinder. This particular layout gives a

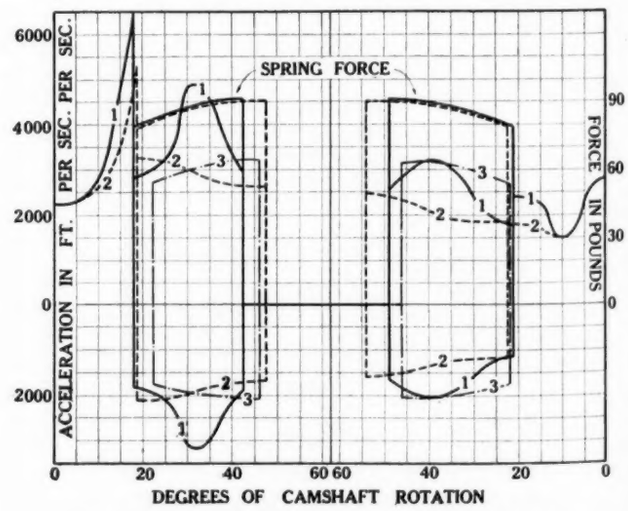


Fig. 11 — Acceleration, spring and inertia force diagrams of special cylinder inlet valve (2000 r.p.m.) (1—¼-in. rad. cam, 2—⅜-in. rad. cam, 3—computed values ¼-in. rad. cam)

much greater deviation from straight-line motion normal to the cam than either of the preceding examples; as a result, we find a valve action of even more erratic characteristics.

Lift, velocity and acceleration curves are shown for both valves when operated by a cam having either a ¼ in. or ⅜ in. tip radius. The increase in the area of the left curves (Figs. 10 and 12) using a ¼ in. radius, as compared to a ⅜ in. radius, is only 3.35 per cent on the inlet and 3.46 per cent on the exhaust. It will be observed that full lift is obtained much sooner on the opening side of the inlet valve than on the exhaust, and that the latter closes in less time than the inlet. This involves corresponding increases in velocity, and is due to respective positions of the followers with reference to the direction of camshaft rotation.

The actual acceleration curves (Figs. 11 and 13) bear no relation to each other; neither does the dotted line, representing the accelerations from a cam of ¼ in. tip radius, bear any relation to the dot and dash curves drawn for the corresponding values obtained by computing for straight-line motion. During a part of the opening period of the inlet valve and the closing period of the exhaust valve, the actual accelerations with a cam of ⅜ in. tip radius are even greater than the computed values with a ¼ in. radius.

The loads of the springs used on this cylinder are barely sufficient to resist the inertia force and overcome friction when using a cam with a ⅜ in. tip radius, although the computed values for a ¼ in. radius cam with a follower having a straight-line path appear well within the limits. If a cam having a ¼ in. radius is used, neither inlet or exhaust cam follower could remain constantly in contact with the cam at normal operating speeds, since the inertia force of the reciprocating valve parts exceeds the spring force even without the usual allowance for friction.

One of the most important conclusions derived from this investigation is that valve accelerations should be accurately obtained for the entire opening and closing periods of both

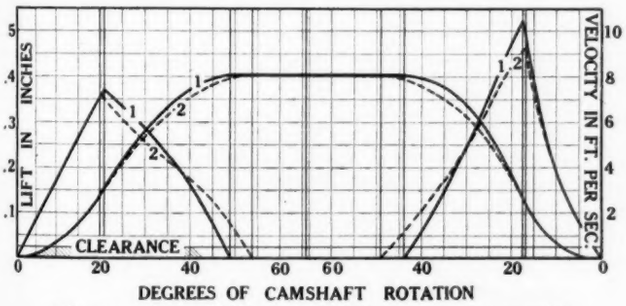


Fig. 12—Actual lift and velocity curves of special cylinder exhaust valve (2000 r.p.m.) (1—¼-in. rad. cam, 2—⅜-in. rad. cam, 3—computed values ¼-in. rad. cam)

inlet and exhaust valves. Although this is perhaps more evident in the case of rocker arm mechanisms, it also applies to true straight-line follower motion when the cam has a long period of dwell at full lift or a small radius at the tip.

It has been clearly demonstrated that, in any type of rocker arm mechanism in which the cam follower travels in an arc, the action of the valves cannot be accurately analyzed mathematically. Regardless of how near to straight-line motion the path of the follower may appear, even in a large scale layout, it is possible that the computed values may vary 30 per cent from the actual. The acceleration curves shown above were all obtained by a double application of the tangential method on a large scale lift diagram.

The degree of error is obviously smaller, the greater the distance between the fulcrum of the rocker arm and

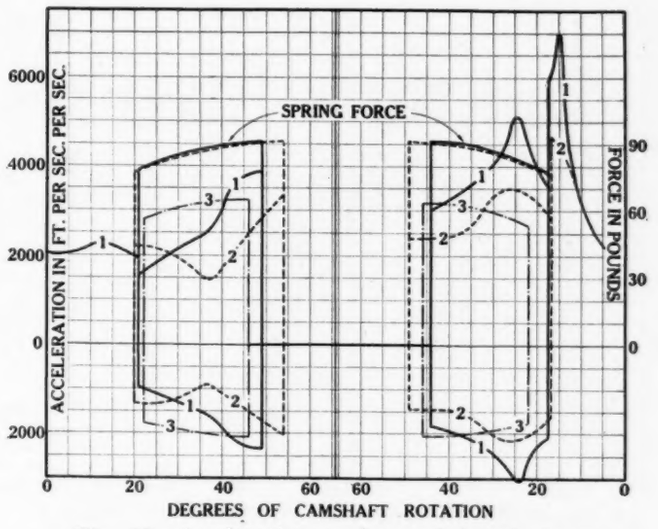


Fig. 13—Acceleration, spring and inertia force diagrams of special cylinder exhaust valve (2000 r.p.m.) (1—¼-in. rad. cam, 2—⅜-in. rad. cam, 3—computed values ¼-in. rad. cam)

the center of the cam follower. Other conditions remaining the same, the error would also be at a minimum when a line through these two points intersects a line through the cam and follower centers at right angles.

The direction of camshaft rotation affects the two valves differently. Consequently in V-type engines, in which the position of corresponding valves is reversed with respect to the rotation of the cams, an investigation of the actual valve action should be conducted for each row of cylinders independently.

It has also been shown that a slight increase in cam tip radius effects an appreciable reduction in the inertia forces. Sometimes a decrease in area of the lift curve of less than 5 per cent by the substitution of a larger cam tip radius, will permit the use of a spring of from 30 to 40 per cent less stiffness. Perhaps the most interesting feature in connection with change in cam tip radius with rocker arm mechanisms is the fact that the characteristics of the acceleration curves bear no resemblance to each other. It is therefore impossible to predict the effect of any slight modification in cam contour upon the valve action curves.

Heater Insulates Exhaust Gases

AN automobile exhaust heater has been developed which features the insulation of the exhaust gases passing to the heater by the returning gases passing from the heater to the muffler.

Insulation is obtained by directing the gases from the exhaust pipe by means of a valve through a small or inner tube to the heater. The gases then circulate through it and return through a larger or outer tube, which encases and protects the heat conducting tube, to the same valve and into the exhaust pipe.

The heating unit is constructed entirely of sheet steel stampings. The container pan is drawn from heavy steel stampings and the cover or register plate is aluminum.

The Noble Heater Co., manufacturers of this device, claim that it has the advantages of quick heating action and freedom from leaking exhaust gases.

THE program for the Fourth International Road Congress to be held at Seville, Spain, has recently been announced. The congress will open on Monday, the seventh of May, and will last six days. Numerous entertainments and excursions have been planned for the visiting guests.

Indexing Fixtures Allow Continuous Cutting and Reduce Labor Needs

One operator handles two or more machines. Methods applicable to connecting rod manufacture despite small size of part and variety of operations necessary. Three jigs are used in rough drilling. Piston pin holes on two rods broached simultaneously.

By J. Edward Schipper

BY the use of indexing fixtures, Northway Motors Co. has effected some direct economies in the manufacture of connecting rods for the G. M. C. truck engine. In AUTOMOTIVE INDUSTRIES of March 15, 1923, on page 612, it was shown how this method is applied to the cylinder block for this same engine with the result that practically continuous cutting is secured on most of the machines. It has been possible to apply the same principle to connecting rod manufacture, in spite of the much smaller size and greater variety of operations involved. While the indexing fixtures are considerably more expensive than other types, the investment is returned by greater continuity of cutting operations and by the fact that with them it is often possible to have one operator take care of two or more machines.

Connecting rods reach the Northway plant in the form of heat treated, rough forgings. They are all inspected and held to between 275 and 310 Brinell. After inspection they are placed in a tumble barrel sand blast which cleans them. Before entering the actual machining operations, the rods are put through a sizing process on a 600-ton Bliss coining press. This operation sizes both ends of the rod, squeezing the metal to within .002 in. of exact dimension. The same machine takes care of both the upper and lower ends of the rod, one die being slipped out and the other placed in very readily.

Continuous Cutting Maintained

The first machining operation is to rough drill the large and small holes simultaneously. In this operation, the center distance is fixed by setting the distance between the drill spindles with a micrometer. The machine upon which this work is performed is really a six-spindle machine, although the two center spindles have been taken out leaving two pairs of drills, one pair for drilling and the other for reaming. A rail passes along beneath the drills, permitting the same jig to be used for both the drilling and reaming operations on the large and small holes. This is a Foote-Burt rail drill installation. Three jigs are used. One is located by the operator while the other two are working, so that practically continuous cutting is maintained. The drill leaves about 1/32 in. for the reaming operations and after the reaming is completed, the holes are held to plus or minus .001 in. tolerance.

A LaPointe broach is used for broaching the piston pin hole in the upper end of the rod as the next operation. Two rods are handled at a time and the object of the broaching operation is to get a proper seat for the bronze bushing which is afterward pressed into the upper end of the rod. Thirty-four inch broaches are used, the operation being self-centering, and locating from the hole in the big end which fits over a locating pin.

The big end of the rod is then faced off at a 7 deg. angle to act as a lock for the babbitt, which is afterward die cast into the lower end. The lower end is also chamfered so that there is no tendency for the babbitt to flow to a square corner when the bearing die-casting operation is performed. A double end fixture is used for machining the connecting rod bearing bolt bosses. The fixture is so designed that while milling on one end on this Brown & Sharpe miller the other end can be loaded.

One Fixture Loaded While Other Cuts

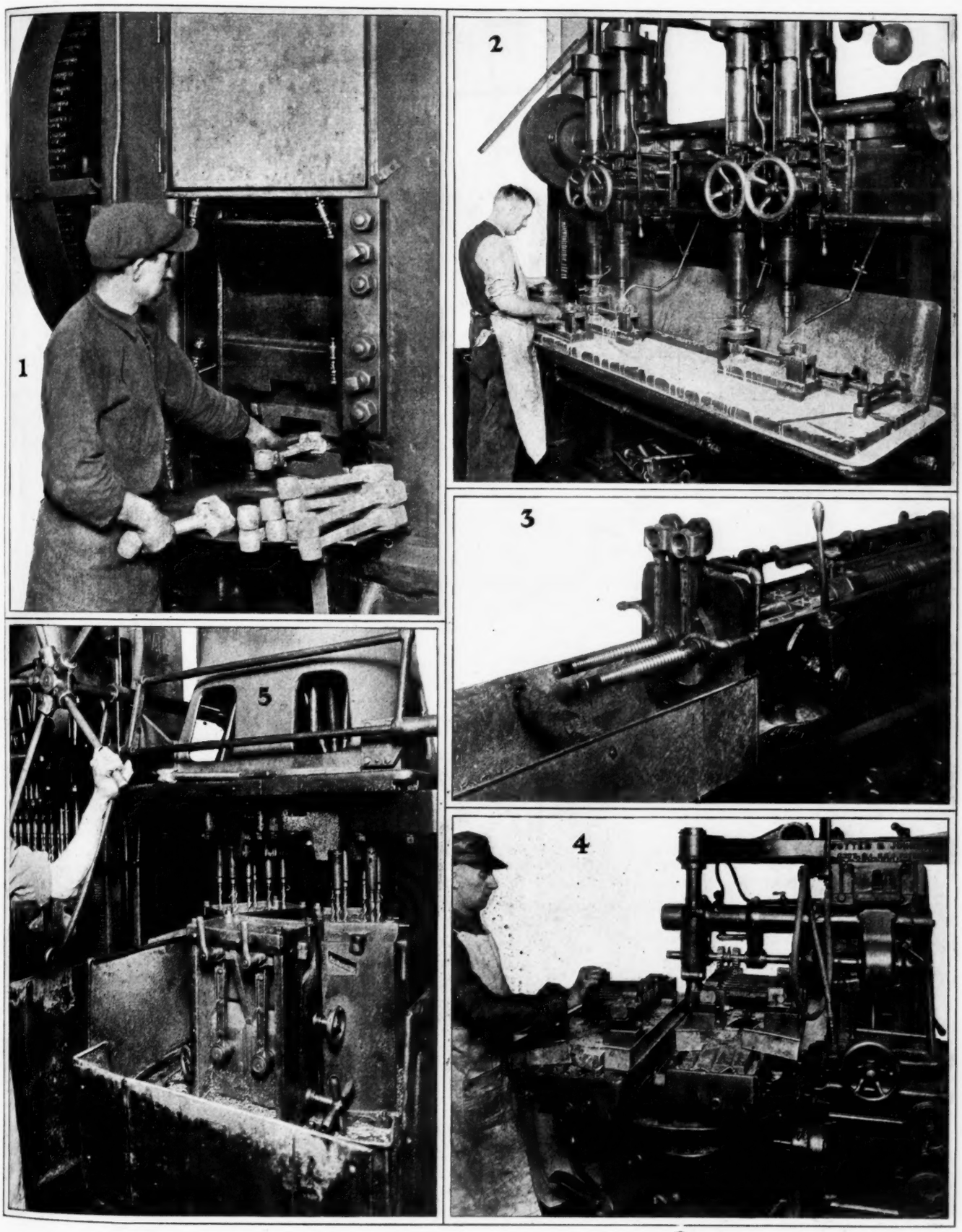
Considerable time is saved on the Potter & Johnson machine which is next used for sawing the caps off the rods and for straddle milling the bolt head and nut seat. The connecting rods are loaded on arbors on a rotating, indexing fixture. One side of the fixture is loaded while the other is cutting. This machine performs the work of two in the usual installation, as generally the caps are sawed off the rods on a plain saw while the straddle milling operation is performed on a separate machine. By combining the two and using the rotating, indexing fixture, with a large number of connecting rods loaded on arbors, it is possible for one man not only to handle this machine, but also the adjacent drill press.

The Natco drill press, handled by the same operator who takes care of the Potter & Johnson machine, is used for drilling the bolt holes in the rod and cap. This operation is also performed on an indexing fixture, which, in this case, indexes at three points. Three point indexing is used because several holes are so close together that it would be impossible to properly design a multiple head with sufficient spindle clearance to take care of them. Drilling the holes, therefore, is broken up into two separate operations, that the distance between the holes simultaneously drilled may be sufficient. With the three-point indexing, two rods can be drilled simultaneously while the fixture is being loaded.

Squaring Rod and Cap

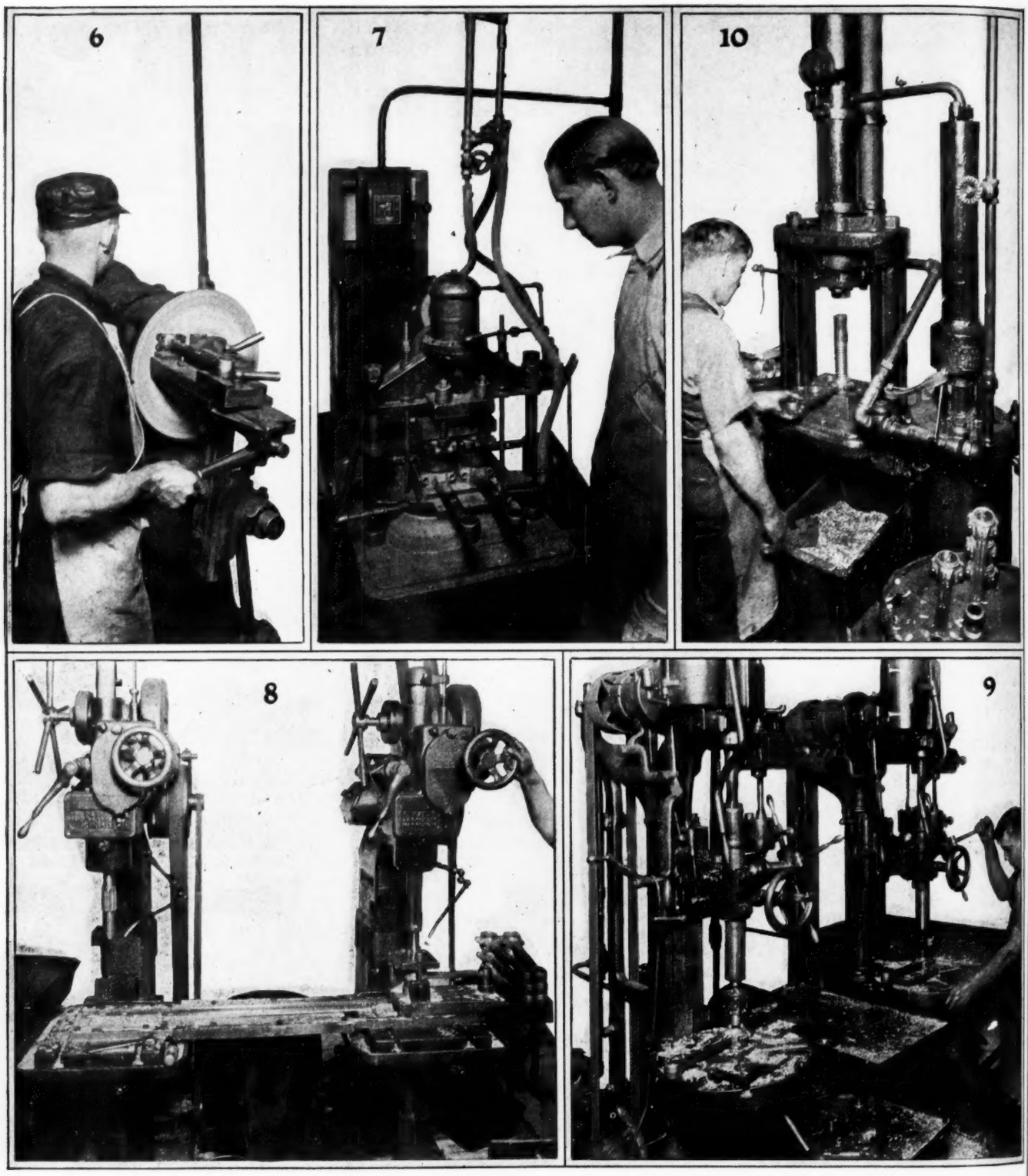
To secure an absolutely square connection between the rod and the cap, a disk grinding operation is performed. The rods are positioned by means of a locating pin through the small hole and by a V-block at the other end. The cap is located simply in a V-block. Grinding these two parts flat squares them so as to compensate for any variation which has taken place in any of the machining operations.

Operations in G. M. C. Truck Connecting Rod Production



1—Coin press operation used to size metal on each end of connecting rod for G. M. C. truck engine. 2—Drilling and reaming both ends of conecting rods. This is a six-spindle Foote-Burt drill with the two center spindles removed. Note three jigs, two operating while one is loaded. 3—Broaching the small ends of the connecting rods with 34 in. broaches to provide seat for bronze bushing. 4—Combined sawing and straddle milling operation. 5—Three point indexing figure used with Natco drill

Grinding, Boring and Semi-Finish Reaming Connecting Rods



6—Disk grinding operation performed on rod and cap to make them square with center line. 7—Chadwick die casting machine which die casts and chills the babbitt for the connecting rod bearing. 8—Rough bore and semi-finish reaming operation on large end of rod. This is a rail installation for indexing. 9—Spot facing and forming radius on large end of rod on Colburn drill. 10—Semi-finish broach on large end of connecting rod, leaving .004 in. for final broach

The rods are milled for the nut seat on the cap, being located on a pin through two of the bolt holes. The next operation, a slot is milled for the oil tube. This tube passes through bosses on the web of the H-section of the rod between the flanges. The rods are then washed in Wyandotte cleaner through which an electric current passes. They are rinsed off and electrically copper plated to provide for taking the babbitt and then are painted with red lead and put in a Chadwick die-casting machine to have the babbitt bearings cast in place. The

machine takes care of two rods or two caps simultaneously. Water is circulated through the mandrel around which the babbitt is cast under low pressure so that it is immediately chilled after being cast in place, resulting in increased density of the metal. After the bearings are die-cast in place, the cap is assembled to the rod, a steel backed, die-cast shim having been inserted in place.

No Change of Set-Up

A rough boring and semi-finish reaming operation is performed next on the larger end of the rod. The machine used is a Colburn, two-head rail drill and the rod is located from a pin through the small end. The holes for the oil tube ends are drilled through both the small and large ends of the rod and the holes are counter-sunk under the second head of the same drill, the same jig being used. This is a rail installation so that it is necessary only to slide the jig from the drilling operation over to the counter-sink without any change of set-up.

The next two operations are performed on adjacent machines which are set up as a battery. These are Colburn drills and are placed four in a row; a pair, however, takes care of the operations on one size rod. In this pair of machines the overall diameter of the big end flange is turned, the location being from a locating pin through the big end. Then the big end is spot faced and the radius formed, the latter being held to .002 in. and checked by a go and no-go gage mounted directly on the machine. The oil tubes are put in the rods, the clips formed by the edges of the milled bosses being peaned over the tube to hold it in place. The tubes are spun over at the ends into the counter-sink at both the large and small ends providing oil tightness.

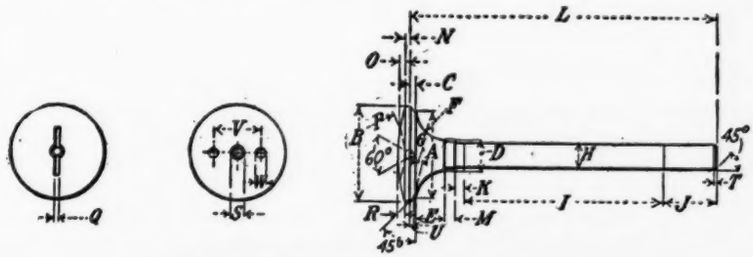
The bronze piston pin bearing bushing is pressed into the upper end of the rod in an Easton production air press. Then this bushing is broached. The big ends of the rods are semi-finished broached leaving .004 in. for the assembly line. In this broaching operation a burnish is put on the surface of the bearings. The finish broach and burnish performed on the assembly line is a hand operation and is, of course, a very light cut since only .004 in. is left to provide for it. It is held to within .0005 in. After passing through the usual straightening and aligning fixtures, the rods are passed along to be assembled with the pistons, from which point they meet the engine assembly line.

Revised Poppet Valve Standards Submitted for Approval

RECOMMENDATIONS for the revision and extension of the present S.A.E. standards for poppet valves have recently been submitted by the Subdivision of the Engine Division for the consideration of engine builders.

The Subdivision of the Engine Division was appointed in August, 1922, to carry on this work. W. S. Willard was appointed chairman, the other members being J. B. Fisher of the Waukesha Motor Co., W. H. Spire of the Steel Products Co., and M. W. Wilcox of the Wilcox Motor Mfg. Co.

The recommended standards given in the report are shown in the following table:



DIMENSIONS FOR CAST-IRON-HEAD POPPET-VALVES

Nominal Diameter *A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I* Length of Valve-Stem Guide	*J* Position of Guide, Valve Closed	*K* Ground Clearance Above Guide	*L* Valve Length Specified in Even 1/4"	*M* Rough-Stem Length 1/32" Minimum	*N*	*O*	*P*	*Q*	*R*	*S*	*T*	*U*	*V*	Drill Diameter *W*
1	1 5/32	5/64	11/32	1/4	1/4	7 1/2	0.2470						1/16	1/16	2 3/4	1/16	1/16	3/16	3/32	3/64	1/2	1/64
1 1/8	1 9/32	5/64	11/32	1/4	1/4	7 1/2	0.2470						1/16	1/16	2 3/4	1/16	1/16	3/16	3/32	3/64	1/2	1/64
1 1/4	1 13/32	5/64	7/16	7/16	7/16	7 1/2	0.3095						1/16	1/16	2 3/4	1/16	1/16	3/16	3/32	3/64	1/2	1/64
1 3/8	1 17/32	5/64	7/16	7/16	7/16	7 1/2	0.3095						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
1 1/2	1 21/32	3/64	7/16	7/16	7/16	7 1/2	0.3720						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
1 5/8	1 13/16	3/64	1/2	1/2	1/2	7 1/2	0.3720						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
1 3/4	1 15/16	3/64	1/2	1/2	1/2	7 1/2	0.3720						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
1 7/8	2 1/16	3/64	1/2	1/2	1/2	7 1/2	0.3720						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
2	2 1/4	1/8	5/8	5/8	5/8	15	0.4340						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
2 1/8	2 3/8	1/8	5/8	5/8	5/8	15	0.4340						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
2 1/4	2 1/2	1/8	5/8	5/8	5/8	15	0.4340						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
2 3/8	2 5/8	1/8	11/16	11/16	11/16	15	0.4960						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	3/64	3/4	3/64
2 1/2	2 13/16	5/64	11/16	11/16	11/16	15	0.4960						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	1/8	1	3/64
2 5/8	2 15/16	5/64	11/16	11/16	11/16	15	0.4960						1/16	3/32	2 3/4	1/16	1/16	3/16	3/32	1/8	1	3/64
2 3/4	3 1/16	5/64	1/8	1	1	15	0.6210						1/16	1/8	2 3/4	1/16	1/16	3/16	3/32	1/8	1	3/64
2 7/8	3 3/16	5/64	1/8	1	1	15	0.6210						1/16	1/8	2 3/4	1/16	1/16	3/16	3/32	1/8	1	3/64
3	3 3/8	3/16	1 1/16	1 1/16	1 1/16	22 1/2	0.7450						1/8	3/16	2 3/4	1/8	1/16	1/4	3/32	3/32	1 1/4	1/16

Heads may be crowned or flat; if flat, *G* should be increased by 7½ deg.
Fractional dimensions take I 0.010-in. limits.
Seat must be true and concentric with stem within 0.003-in., indicator reading by standard method of inspection.
Stem diameters shall be gaged with limit gages.
Stem diameters are based on S. A. E. Steel No. 1020.

Portugal on Eve of Motor Vehicle Transport Expansion

Present equipment inadequate for country's needs. Railroad lines must be supplemented. Bus routes can be established to advantage. Opportunities to do business with colonies. Unfavorable exchange rate severe sales handicap at present.

By E. C. Petrie

PORTUGAL is about half the size of the State of Washington and has more than four times its population, but it only possesses about 5 per cent of the motor vehicles now operating in the Western State. Yet Portugal is destined to become a motor transport country. Its most remote corner is not more than 125 miles from the sea, road material abounds and railway construction is very difficult owing to the hilly nature of the country.

The motor census for last year shows that Portugal possesses 10,000 passenger cars, 600 trucks and 5000 motorcycles. In addition to the fact that this number of vehicles is wholly inadequate to the transport needs of the country lies the opportunity of doing business with the Portuguese colonies by representation at Lisbon.

The geographical position of the Republic is also a reason why American manufacturers should take steps to get representation there. Thousands of visitors visit the country every year from the Azores, Madeira, Portuguese Guinea, Angola, Mozambique and the Portuguese Indies, while many wealthy Brazilians make it a port of embarkation when visiting Europe. It must always be borne in mind that Portugal has little in common with Spain.

Portugal, however, cannot for the moment be regarded as a ready market. The country, always poor, has been further impoverished by revolution and war. The roads are almost everywhere in a bad state, sometimes being so bad as to be utterly useless for motor transport. Those who possess motor vehicles find that repair facilities are almost entirely absent, while maintenance expenses run very high owing to the abnormal cost of gasoline. Last comes the low value of the escudo.*

During 1922 motor importers had a trying time. For the first few months sales were practically nil, but during the spring and summer matters improved to such an extent that one dealer alone sold twenty-five cars in a few weeks against a total lack of business for the previous twelve months. As the year wore on, however, the market again lapsed into quietude. The closer relationship between the escudo and the franc, in addition to the geographical contiguity of the countries, has given French automobiles major sales in Portugal. In 1919 cars to the value of 5,000,000 francs were shipped from French ports to Oporto and Lisbon. In 1920 this figure was nearly trebled, while in 1921 sales exceeded 6,000,000 francs.

*The gold escudo is nearly equivalent to the dollar.

The United Kingdom sent thirty complete cars and twenty-five chassis to Portugal during 1920 and 1921. German activity tends to increase, but no reliable figures are available. Italy sent 189 automobiles in 1920, and about fifty in 1921, mostly Fiats. Details of imports from the United States for 1913 and the four post-war years follow:

Year	Passenger Cars	Trucks	Tractors	Parts	Tires
1913	73	1	..	$920	$282
1919	320	30	39	58,031	176,303
1920	540	156	17	176,328	367,321
1921	18	1	6	36,189	17,166
1922†	60	4	..	30,000	70,000

†Estimated.

Last year the Government railroads incurred a deficit of about 12,000,000 escudos. Despite this, money is still being spent on extending the country's 2000 miles of lines, and last July a bill was passed allocating 15,000,000 escudos for this purpose. The small size of the country, however, suggests that money would be better spent on road than on rail construction, and it is clearly evident that propaganda is needed to educate both the authorities and the population to the greater economic possibilities of motor traction. Not that road construction is being wholly neglected. In 1920 the Government passed a bill for the repairing of the national roads, its program being the construction of 2500 miles of motor roads by 1930, and the repair of 3500 miles of existing roads by 1927.

High Power and Economy Needed

To negotiate Portuguese roads motor cars must possess high power in proportion to capacity, for the hilly nature of the country is such that springless wagons have to be drawn by long teams of oxen, while in Oporto one grade is only negotiated by a street car with the aid of ten mules. At the same time engines must be economical. Although petroleum has been found locally, production is so small that the country is entirely dependent on foreign sources for fuel. Ultimately there will be a demand for electric vehicles, for the water power resources of the country are not only great in comparison with its size but the matter is receiving official attention.

The truck market is mainly in the hands of French and German importers. More than half of the trucks in the country operate in the vicinity of Oporto, although

up to the conclusion of the war commercial vehicles were practically unknown in northern Portugal. Most of the trucks in use are of the heavier type. American exporters wishing to gain a footing here must send over salesmen with a good knowledge of Portuguese and equipped with powers to offer ample credit and the promise of prompt delivery. Representatives must also make it their business to inquire into the present system of sales in Portugal. It is said that in many cases dealers will not sell unless they can clear a profit of 100 per cent.

This extortion is complicated by high duties. The tariff rates for passenger cars under 18 hp. is 320 gold escudos; for vehicles above 18 hp. 770 gold escudos. Trucks only pay duty of 22 escudos. In addition to these charges, fees of 2 per cent of the invoice value of goods are assessed for the certification of consular invoices and an invoice must be sent with each consignment.

An attempt is being made to develop local body construction, and last July a decree was passed permitting local body manufacturers to import chassis free of duty provided the vehicle was re-exported fitted with a body within twelve months. Another reason for the passing of this regulation is the attempt to supply motor vehicles to Portuguese colonies by way of the mother country.

Most of the business done in tires in Portugal goes to France, although there are fairly definite signs that American tires are getting a firmer foothold. About 40,000 tires were sold last year. Eighty per cent of the tires in use are metric clinchers and 15 per cent inch clinchers, the remaining 5 per cent being straight side tires imported from America. The import duty is 5 centavos (gold) per kilo.

Opportunity to Install Bus Lines

There would appear to be a great opportunity for the wide introduction of motor buses into Portugal. Within a 50-mile radius of Oporto lies most of the agricultural activity of the country, and bus and truck lines running to Braga, the Paiz do Vonho, and Vizeu should prove profitable ventures. Braga could be made the center for bus lines running to Ponte de Lima, Moncao, Salamonde, Aboim, Guimaraes and Espozende. The neighborhood of Braganza is uncultivated owing to lack of communications, and lines running to Vinhaes, Franca and Vimioso would do much to open up the northeast corner of the Republic.

In Beira bus lines could with advantage be established between Covilha and Unhaes do Serra; from Guarda to Sabugal and Barca d'Alva; from Lamego to Peso de Regoa and Vizeu, and from Vizeu to Mangualde. In Estramadura lines might be established from Leiria to Pombal, Torres Novas and Chao de Macoas; from Thomar to Paialvo; from Santarem to Almeirim and Obidos; from Torres Vedras to Lisbon and Santarem, and from Setubal to Cezimbra and Aguas de Moura.

In Alemtejo lines are suggested to connect Sao Martinho with Villa Nova de Milfontes; Portalegre with Castello de Vide, and Coruche with Raia. In Algarve opportunities exist for bus services to connect Silves with Lagos and Monchique, and Faro with Loule. Most of these projects are at the moment impracticable, but over many of these stretches of roads improvements are either contemplated or proceeding.

Portugal has a very heavy tourist traffic, and rightly so, for perhaps no country in the world with so small an area possesses such a variety of scenery. The northern mountains have been compared with the Alps, the main estuaries give an impression of Holland, the central western coast has many features in common with the French Landes, the Algarve compares favorably with the beauty of northwest Africa, the vine-clad terraces of the Douro and Tagus can be compared with those of the Rhine and the Elbe, the harbors of Lisbon and Oporto vie in beauty with those of Naples and Constantinople, while the Portuguese Riviera in the neighborhood of Lisbon is equal to Nice or Bordighera. At the present time tourists meet with much discomfort in Portugal, and it is certain that if long distance motor coach services were to run from Lisbon and Oporto they would be both appreciated and well patronized.

Tractor Sales Hindered

Portuguese farmers are the most prosperous section of the community and there is a distinct tendency toward the adoption of power farming. It must be stated, however, that few types of tractor are suitable, for the greater part of the country is stony as well as hilly. Only in the plains of Alemtejo do most tractors perform satisfactory work. The type of tractor best suited to the country should be cheap and solid in construction; small in size, yet powerful enough to till land on steep hillsides.

At present many American tractors are lying in the warehouses of Oporto and Lisbon, dealers complaining that their chief handicap to sales is the difficulty experienced in getting in touch with the farming class. It would appear, therefore, necessary for manufacturers to organize demonstrations throughout the country with a view to making farmers realize the value of tractors. In the Oporto area it will be necessary to get farmers to combine for the purpose of purchasing tractors, for here holdings are very small. The introduction of tractors should also prove of value in exploiting the lumber resources of Portugal, but the market cannot be regarded as encouraging until surplus stocks have been sold, or until tractors due to be received from Germany by way of reparations have been absorbed.

As is often the case with countries suffering from depreciated exchanges, motorcycles are being bought by many of those Portuguese who are waiting for the time to come when they might be able to afford cars. Most of the motorcycles sold nowadays are of the small and inexpensive type, many of which are equipped with sidecars. Nearly all the present business is going to two American and two British makers. A motorcycle taxi service has been introduced in Lisbon and, as the tariff of charges is only half that of taxicabs, it is proving popular.

About 50,000 Portuguese are employed in fishing. Of the 12,000 boats used for this work very few are equipped with marine engines. As boat construction is carried on extensively at Vianna do Castello, Oporto, Aveiro, Figueira la Foz, Lisbon, Setubal and Olhao, these ports should be visited by salesmen. Apart from the sea, the rivers teem with fish, and the Minho, Limia, Ave, Douro, Aveiro Lagoon, Mondego, Tagus, Sado, Mira, Silves and Guadiana are all navigable to motorboats.

Tool Steel Specifications

CARBON tool-steel specifications have been tentatively approved by the Sub-Sub-Committee of Committee XIV of Committee A-1 of the American Society for Testing Materials. These specifications cover six classes of carbon tool-steel as determined by the chemical compositions.

The specifications cover the purposes for which the classes are frequently used; process of manufacture, crucible or electric-furnace; annealing; chemical composition; methods of analysis; permissible variations in dimensions; finish; marking and inspection and rejection.

Exports of Cars, Trucks and Tires for

COUNTRIES	GASOLINE PASSENGER CARS								GASOLINE TRUCKS					
	Up to $500		$500 to $800		$800 to $2000		Over $2000		Up to 1 ton incl.		1 to 2½ tons		Over 2½ tons	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Europe														
Austria					1	$1,045								
Azores and Madeira Islands														
Belgium	311	$87,075	9	$5,808	18	24,359	3	$10,548	529	$117,580				
Bulgaria														
Czechoslovakia														
Denmark	14	6,569	69	41,503	82	71,659								
Esthonia	1	324							1	393				
Finland					5	4,500								
France	3	1,142	5	2,665	3	2,719	7	51,895						
Germany								2,500						
Greece					2	2,800			1	393				
Italy	221	62,262	7	3,949				3,100	25	5,983				
Lithuania					5	6,128								
Malta, Gozo and Cyprus	28	8,917							7	2,548				
Netherlands	9	4,026	33	22,248	22	26,140	6	19,051						
Norway	1	500	6	4,655	20	23,044	2	4,164			4	$4,728		
Poland and Danzig														
Portugal	1	375			2	2,398	1	3,500						
Rumania					14	16,054	3	9,180						
Russia			1	725			3	12,880						
Spain	30	8,431	49	34,408	54	59,789	8	17,610	176	42,345				
Sweden	8	3,900	29	20,191	61	64,177	4	9,864			12	7,176		
Switzerland	3	1,470	8	4,040	18	19,114								
Turkey	20	6,704												
Ukraine	4	1,572							5	2,250				
England	10	4,881	113	75,622	138	133,561	12	38,937			24	26,885		
Scotland			2	1,416										
Ireland	26	10,890							1	520				
Yugoslavia Albania and Fiume			1	754										
North and South America														
United States														
British Honduras														
Canada	90	32,618	156	100,602	179	207,454	49	141,115	18	14,895	29	41,990	8	$21,551
Costa Rica					2	2,635								
Guatemala					3	4,272					1	1,302		
Honduras	4	1,457			1	1,000			1	354				
Nicaragua														
Panama	16	5,386	3	2,151	19	23,613			7	2,548			1	5,886
Salvador			1	505	1	1,362								
Mexico	279	90,682	85	63,562	90	89,855	5	14,368	30	12,928	12	9,952	4	10,912
Newfoundland and Labrador	3	600												
Barbados	8	3,370							6	2,063				
Jamaica	21	7,438	14	10,482	15	15,426			20	7,280	5	10,423		
Trinidad and Tobago			2	1,507	5	5,616								
Other British West Indies	18	4,888	1	796	6	6,667			16	5,490				
Cuba	376	108,086	17	12,194	34	41,973	35	91,239	57	14,776	3	3,372		
Dominican Republic	30	9,917	6	3,604	2	1,968			3	1,122	1	2,027		
Dutch West Indies	1	298			2	1,764								
French West Indies					2	2,469								
Haiti	2	674	4	2,898	5	4,007					1	3,950		
Virgin Islands														
Argentina	27	10,220	14	10,623	118	128,288	15	39,945			4	6,385	5	14,515
Bolivia			1	754	4	4,932								
Brazil	31	8,809	33	23,026	92	89,923	5	12,389						
Chile	43	12,921	3	2,124	8	10,062			17	6,240				
Colombia	11	2,962	1	784	13	16,013			4	2,220	7	9,074	6	21,918
Ecuador	4	1,497							8	2,912				
British Guiana														
Dutch Guiana			2	1,100										
Peru	10	3,895	4	2,873	2	1,808			15	5,461	6	7,598		
Uruguay	107	29,874	27	17,810	22	23,560	1	3,047	10	2,536				
Venezuela	17	6,390	11	5,555	8	8,151			5	1,821				
Asia														
Aden			3	1,650										
British India	3	1,284	26	16,172	9	8,713	1	2,093						
Ceylon			7	4,257	5	6,026								
Straits Settlements			23	13,261	11	10,926	2	4,406			1	3,655	1	2,665
Other British East Indies														
China	1	463			27	30,788								
Chosen														
Java and Madura			31	23,358	33	34,897								
Other Dutch East Indies					17	16,450								
French Indo China			3	2,372	3	2,862								
Hejaz, Arabia and Mesopotamia	32	10,190												
Hongkong	7	3,500	2	1,100	9	9,827								
Japan	136	42,613	21	14,817	17	18,849	72	30,453			6	13,250	4	8,490
Palestine and Syria	15	4,711	3	2,400	9	9,544			16	5,696				
Persia														
Philippine Islands	36	13,669	36	26,375	32	32,769	3	8,255	16	10,028	2	2,065		
Siam														
Turkey														
Oceania														
Australia	66	30,789	709	562,793	417	415,311	19	47,778	65	53,539	60	73,424	21	32,891
British Oceania														
French Oceania														
New Zealand	1	300	98	69,213	88	91,396	1	2,466	8	6,967	19	23,000	2	1,808
Other Oceania														
Africa														
Belgian Congo									8	2,912				
British West Africa	1	364	21	14,191	3	2,826			16	16,592	4	4,108		
British South Africa	2	992	112	81,145	139	137,265	3	8,291	4	3,405	1	5,000		
British East Africa	4	1,798	6	3,707	5	4,721								
Canary Islands			3	1,650	5	4,879								
Egypt			1	753	7	6,328	1	4,413						
Algeria and Tunis			3	1,650			1	3,400						
Other French Africa	5	1,644												
Morocco														
Portuguese East Africa											2	6,500		
Other Portuguese Africa	2	900			2	1,944					1	400		
Total	2,099	$664,237	1,825	$1,321,798	1,916	$1,996,626	204	$596,887	1,095	$353,797	205	$266,264	52	$120,630

January, 1923 | Canadian Exports

ELECTRIC VEHICLES		PARTS	TIRES						PASSENGER CARS		TRUCKS		PARTS	COUNTRIES
			Casings		Solid		Inner							
No.	Value	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	Value	
														Europe
		$58												Austria
		95,916	1,576	$21,458	2	$165	370	$580	35	$26,922			$53	Azores and Madeira Islands
		22												Belgium
			10	237										Bulgaria
		429,862	8,495	89,188	22	784	4,594	8,657					12,811	Czechoslovakia
		639	10	258			20	50						Denmark
		26	8	199			2	3						Esthonia
		375,009	952	13,294			37	309						Finland
		545	252	3,906			102	220						France
		450	874	8,992	32	1,210	385	486		1,566				Germany
		26,279	405	5,131			378	522						Greece
			39	922			20	39						Italy
		873	45	286	16	288								Lithuania
		8,828	1,959	27,382			1,304	2,170	51	38,165			46	Malta, Gozo and Cyprus
		6,516	1,229	19,372	48	1,538	718	1,694	8	8,156			87	Netherlands
		71	175	1,711			300	473					804	Norway
		1,428	7	87			26	36						Poland and Danzig
		909	292	5,749	110	4,268	423	988						Portugal
		435			20	2,200								Rumania
		84,073	1,096	14,848	89	2,165	891	1,569	38	32,411			11,633	Russia
		12,373	1,215	18,189	12	509	396	770	114	49,686			870	Spain
		569	4	16										Sweden
		549	120	1,133										Switzerland
		429												Turkey
2	$2,800	729,097	19,018	197,879	2,090	21,124	6,808	11,454	1,564	1,063,230	4	$5,895	43,149	Ukraine
		233	696	7,614			458	1,922						England
		11,000	583	4,805			354	498						Scotland
		278	709	9,523			1,560	2,875						Ireland
														Yugoslavia, Albania and Fiume
									6	3,864			4,536	North and South America
		22					114	186						United States
15	20,238	1,314,611	5,832	49,069	290	10,338	1,819	2,428						British Honduras
		958	87	1,069					5	4,530				Canada
		943	222	4,185			123	280					58	Costa Rica
		1,075	109	2,731	26	1,043	18	63					18	Guatemala
		21	94	965			124	196						Honduras
		12,755	1,285	15,212	110	1,941	1,150	1,917						Nicaragua
		1,067	28	541	12	361	22	48	1	1,135			212	Panama
1	320	51,914	5,516	63,475	91	2,181	6,441	11,234	1	500			203	Salvador
		533	4	60			4	8					33	Mexico
		242	163	1,823	6	61	166	286						Newfoundland and Labrador
		9,716	610	8,292	199	3,728	524	1,145						Barbados
		4,529	633	8,153	20	526	769	1,281						Jamaica
		3,781	215	2,125			321	447	17	12,678			77	Trinidad and Tobago
1	1,481	99,489	9,449	90,441	514	16,651	6,760	10,336	16	14,208			37	Other British West Indies
		9,601	711	6,739	64	981	900	1,572	5	5,005			178	Cuba
		770	89	714	4	60	115	164	93	28,322	2	668	1,315	Dominican Republic
		1,216	219	2,579			44	89						Dutch West Indies
		3,967	309	3,876			675	1,036						French West Indies
		468	26	257			38	82						Haiti
		361,582	14,927	133,632	126	2,968	8,486	11,093	83	87,365			17,843	Virgin Islands
		223	126	1,959			188	294						Argentina
		301,293	6,491	45,117	171	3,091	3,858	4,974	40	38,363			41	Bolivia
		7,846	1,994	33,183	8	308	2,019	3,975						Brazil
		7,774	883	13,894	22	533	1,163	2,638	2	1,891			102	Chile
		554	139	2,085			208	435	1	1,093				Colombia
		616			28	424	107	158	7	5,374				Ecuador
														British Guiana
		9,588	1,559	20,586	48	1,452	1,438	2,611						Dutch Guiana
		34,329	1,203	12,114			464	801	24	19,176				Peru
		10,136	569	5,908	4	123	1,250	2,133						Uruguay
														Venezuela
		864												Asia
		29,350	1,426	12,665	280	5,407	3,495	4,486	257	122,385	50	16,700	1,059	Aden
		1,292	154	1,412	34	601	513	620	28	14,050	6	2,004	11,038	British India
		10,047	419	3,635	14	360	230	330	31	10,193			2,144	Ceylon
		350											19,828	Straits Settlements
		1,879	170	3,479	200	8,934	112	244						Other British East Indies
		45	335	3,338			414	503						China
		10,704	1,458	17,810	407	12,516	394	647						Chosen
		4,619	372	5,840	62	1,977	53	113						Java and Madura
		1,278	241	3,659	6	90	210	423						Other Dutch East Indies
		4,691	174	1,385			144	181						French Indo China
		512	2	71			20	200	9	6,114			4	Hejaz, Arabia and Mesopotamia
		56,721	2,933	28,505	428	7,514	308	593	10	6,416				Hongkong
		20,322	286	2,675			118	220	6	4,786				Japan
			2	122										Palestine and Syria
		11,692	3,887	45,873	102	2,674	3,084	5,633						Persia
		479	50	607			30	73	4	1,696	5	1,670		Philippine Islands
		84	12	330			16	40						Siam
														Turkey
3	7,920	100,794	4,898	73,793	920	26,129	1,129	2,419	1,800	711,091	277	105,884	90,016	Oceania
		302	12	143			12	24						Australia
		278	17	251			4	7			3	1,002	191	British Oceania
		28,253	8,318	97,606	1,097	30,533	4,013	6,584	236	124,038	18	6,012	554	French Oceania
		427	10	204			36	63						New Zealand
														Other Oceania
		157												Africa
		9,001	1,925	33,247			2,568	6,396	15	4,378			5,354	Belgian Congo
4	3,374	18,135	4,013	43,757	143	3,095	4,244	6,018	143	75,016			897	British West Africa
		1,604	695	6,326	6	60	265	597	9	2,871	4	1,426		British South Africa
		2,135	152	1,706	48	1,071	129	175						British East Africa
		6,786	753	4,609			448	829					28	Canary Islands
			71	643			70	93						Egypt
		2,521	73	832										Algeria and Tunis
		555			100	1,811			4	2,500				Other French Africa
		556												Morocco
		602	51	731			34	56	1	741				Portuguese East Africa
														Other Portuguese Africa
26	$36.133	$4,365,121	126,180	$1,378,217	8,031	$183,793	80,547	$134,792	4,666	$2,530,005	369	$141,261	$225,219	Total

Reduction in Indirect Costs More Important Than Lower Wages

Labor rate has little influence on total sales price. Undue emphasis laid on this factor. Study needed to permit higher pay without increasing unit cost of production. Elimination of waste in all departments requires cooperation of workers.

By Harry Tipper

THE shortage of labor both in the skilled and unskilled departments is being felt all through the metal trades, although the emphasis at present is more on the unskilled than the skilled workers. This shortage, together with the increase in commodity prices, brings up again the question of probable labor costs in the near future. If the rise in commodity prices continues, a demand for higher wages is expected in some quarters and in other quarters there is a tendency to consider the automatic payment of higher rates when the rise in the cost of living index indicates this necessity.

This brings up again the question of the influence of direct labor costs upon the total cost of manufacturing in the automotive field. An examination of one or two plants conducted some time ago, showed that in proportion to the manufacturers' sales price, the direct labor cost ran between 14 and 18 per cent, and in proportion to the total manufacturing cost, including the manufacturing, overhead, etc., the proportion of direct labor was between 20 and 25 per cent. On the basis of the manufacturers' sales price and a labor cost of 18 per cent, an increase in the labor rate of 10 per cent would have an influence of 1.8 per cent on the total sales price.

The influence of a considerable increase in the labor rates, therefore, on the total sales price is comparatively small. The labor rate is unduly emphasized in the considerations of the subject—while it is true that from a broad, economic standpoint, the entire cost of production is involved in the labor costs of all kinds and there is practically no other cost save labor. For any individual industry or any individual concern, the direct labor involved in the operations of manufacturing is only a small proportion of the total cost. Raw materials usually involve at least twice as large a percentage and overhead, including all the indirect elements, involves as much or more than raw materials.

The rates to be paid to skilled and unskilled labor in manufacturing work affect direct labor costs almost entirely and their influence is confined to 15 or 20 per cent of the total costs involved in that area. This only brings us back to the point that the influence of labor rates on the total cost of manufacturing is entirely misplaced in the discussions upon the subject, and in most of the manufacturers' calculations upon it. Even a 20 per cent increase in the rate of direct labor would influence the total cost not more than 4 or 5 per cent. The two factors of importance to consider in preparing for the probability of an increase in labor rates are:

1. The methods to be adopted by which the increased rate can be paid without affecting the unit cost of production.
2. The study of overhead and indirect costs in the endeavor to provide for the accommodation of the increased rate on the direct labor, without influencing the total cost.

"THE tendency of wage rates to increase as labor becomes scarce and the cost of living rises demands a closer study of the factors which really influence the entire factory cost.

"Increases in commodity prices are the last resort because they tend to limit market possibilities."

Unit Cost the Keystone

The unit cost of production in two metal trades factories in the same town working on much the same operations and with the same labor rates, varied 25 per cent, indicating that the influence of management upon the production pace—and therefore the production cost—was of far more importance than a 10 or 20 per cent difference in the rate of wage paid.

A constant examination of the labor condition from the standpoint of the unit cost in production, and its constant consideration with the former workers of the different departments, has resulted almost always in a change of methods, operations and pace so as to permit the highest rate without increasing the cost.

There are many small areas of waste in all departments of a manufacturing plant which cannot be eliminated without the cooperation of the worker and without the enlistment of his interest in the matter. Very frequently the worker does not know the variation in the cost of production in connection with the operations he is interested in. There is no reason why he should know because the matter is not his responsibility and he is not expected to burden his mind with the problem at all.

Every man, however, is interested in the result of his work and in all cases where it has been possible, by simple methods, to show the fluctuations in the cost of production arising out of the small individual wastes, the workers themselves have been willing to correct some of them in order to make a better showing. A ten per cent increase in wage rates, exerting as it does only a 1.8 to 2.5 per cent influence on the total cost, is not nearly so important as the consideration of the small

wastes which affect the production cost, regardless of the rate of pay and which are always present unless the worker is vitally interested in the results of his job and in the records he is making.

The same accumulation of small wastages is to be seen in a factory overhead, only that these wastages are larger in proportion to the total area.

The statistical analysis of indirect costs has never been worked out with the care and accuracy which have been applied to the examination of direct costs. Inasmuch, however, as indirect costs are at least twice as large in percentage as the direct labor costs, the opportunity for analytical examination in these particulars is obvious.

In estimating the cost of a job going through the factories, the writer has had occasion to observe many times that the calculations of overhead are subject to at least a plus or minus 10 per cent probable error, where the calculations in direct costs are frequently accurate to a plus or minus 1 per cent or less. This arises because the analysis of the indirect costs has not been carried far enough to show the exact bearing of these indirect expenditures upon the operations of the departments and upon the flow of production through those departments, so that in estimating costs at any time, allowance must be made for a considerable variation in the application of the indirect costs to their particular piece of work.

Indirect Costs Mount Too Easily

It is a very difficult matter to keep the indirect departments in a factory from expanding their systems, methods or organization more rapidly than the increased volume of production would warrant and it is a still more difficult matter to keep the necessary departmental organization of these overhead necessities from complicating the system to the extent of impeding the processes and the decisions so that a larger cost is added to each individual piece of work than it should bear under orderly organization and consideration. Anything which impedes the rapidity of the decisions or which complicates the mechanism of the system unnecessarily, is a very direct addition to the unit cost.

In talking with an official of one of the largest companies in a certain line of business not long ago, he admitted that it was impossible for this company to compete, quantity and quality considered, with a medium sized corporation established in the same field, mentioning the corporation in question, and he laid it principally to the delay in decision and the complication of the system due to the enormous organization.

Simplification of Systems Difficult

It is a comparatively easy matter to arrange a system which will departmentalize and specialize, but it is a very difficult matter indeed to simplify the system so that it represents the minimum mechanical requirement in order to secure orders and prevent confusion. There is a tendency in the growth of such a system to transfer the decision constantly further and further away from the point at which the problem is encountered. The area of judgment permitted the supervisor at the point of the problem becomes less and the decision must be made at some distance from the actual circumstances. This not only delays the process itself, but it demands frequently more attention than is required when the problem is attacked at the time and point of its occurrence so that the matter is passed backward and forward and the decision upon it delayed.

In almost all systems of indirect operation, in connection with the factory, there are wastages of this kind and other wastages incidental to the complication of the system, which are more important in their influence upon the total cost than a probable advance or decline in the wage rate.

"THE statistical analysis of indirect costs has never been worked out with the care and accuracy which has been applied to the examination of direct costs.

"Inasmuch, however, as indirect costs are at least twice as large in percentage as the direct labor costs, the opportunity for analytical examination in these particulars is obvious."

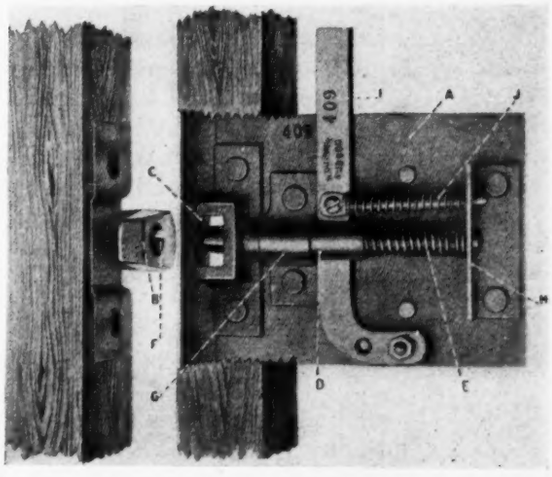
The tendency of wage rates to increase as labor becomes scarce, and the cost of living rises, demands a closer study of the factors which really influence the entire factory cost.

Increases in commodity prices are the last resort because they tend to limit market possibilities. Consequently, wherever possible, the increased rate of pay should be compensated by more careful consideration of the wastes involved in the direct labor cost of production and wastes involved in the small leakages in the indirect cost due to the complication of the system and the improper delegation of judgment and responsibility.

Citroen Using Improved Door Lock

AN improved and patented type of door lock produced by the Citroen company is now used on all cars manufactured by that concern. The peculiarity of the lock is a double cone which automatically takes up all play and prevents movement in either a vertical or a horizontal direction. The device makes unnecessary the use of rubber or other stops or wedges.

As shown in the illustration, the catch B, bolted to the door post, is conical in both a horizontal and a vertical direction and has a conical hole F, into which the bolt D is pushed under the pressure of the coil spring E. The Citroen lock saves time in adjusting doors and is claimed to be inexpensive to produce.



Citroen door lock with double cone construction which automatically takes up play in vertical or horizontal direction

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE
Reg. U. S. Pat. Off.

PUBLISHED WEEKLY

Vol. XLVIII Thursday, April 12, 1923 No. 15

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Extra postage west of the Mississippi River on account of Zone Postage Law 0.50
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Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; A. C. Pearson, Treasurer; Fritz J. Frank, Secretary.
Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.
Member of Associated Business Papers, Inc.
Member of the Audit Bureau of Circulations.
Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly) July, 1907.

Keeping Dealers in Business

THE automobile is the only unit of its size that has ever been sold in large quantities through dealers who paid cash to the manufacturer and then sold to users largely on a time payment basis. Demand for individual transportation was so great that this somewhat extraordinary method of merchandising was carried on without much difficulty up to a few years ago.

Keen competition, used cars and increased volume then began to cause trouble. The old machinery began to falter. A serious depression came along and many dealers went under. A period came in which there were not enough soundly financed dealers to take care of the distribution needs of manufacturers. Such a condition prevails now.

These changed conditions are demanding some revision in the financial phases of automotive merchandising practice. Just what these changes will be is not yet clear. Numerous experiments already under way, however, point to probable future developments.

Superficially the financial relation between dealer and manufacturer has not changed. The practice is still for the car maker to receive cash and for the dealer to sell on time.

But a change is taking place just the same. Most large manufacturers are coming to believe that they will have to play an active, as well as an educational rôle in connection with dealer finance. This sentiment has been expressed by the presidents of many organizations, while active steps have already been taken in certain notable instances.

Ford has made deposits in various banks throughout the country with the understanding that certain credit facilities shall be extended to his dealers. Willys has arranged with a Toledo bank for a $7,000,000 fund which is available to his dealers for credit purposes. The General Motors Acceptance Corporation has been functioning actively for several years. Probably other examples could be cited.

Banks will usually take care of wholesale automobile paper in prosperous times, but they are liable to curtail their assistance when sales fall off and used cars begin to pile up. This is just the time at which the dealers need some sort of credit facilities worst. The problem faces manufacturers who need stable dealer organizations just as directly as it faces individual dealers.

Four-Wheel Brake Patents

MANUFACTURERS who are considering the use of front-wheel or four-wheel brakes should, before adopting any design as standard equipment, look carefully into the patent situation and either avoid constructions already patented or make terms with the owners of controlling patents before going into production.

About 60 United States patents pertaining to front-wheel and four-wheel brake operating mechanisms have been issued. Many other applications for patents probably are pending now. The art pertaining to brakes of this character is by no means new, as is evidenced by the fact that there is an expired patent No. 797,251, issued in the name of Atkins, as long ago as August 15, 1905. This patent expired last year and it may well be that there are still earlier patents. The Atkins patent shows a four-wheel drive and steer with a vertical reciprocating sleeve on an extension of the steering knuckle pivot. The sleeve is reciprocated by a collar connecting the brake linkage to a bell crank. An extension of this sleeve controls the brake shoe so that the brake can be operated, no matter in what position the wheels are turned, that is, the act of steering does not affect the brake operation. In this particular case the brakes on all four wheels are operated simultaneously.

Since 1905 there have been numerous patents issued at frequent intervals, but according to one attorney who has given the matter some study, none of them is of fundamental scope. According to the same authority, the principal feature of all of these patents has to do either with the way in which the front and rear brakes are interconnected, or to the manner in

which the operating force is applied, in order to be uninfluenced by the angle of the steering wheel.

For example: In some cases the brakes are so interconnected that they are applied simultaneously, or one set before the other, or diagonal wheels are interconnected. There is also a considerable variety of ways in which the brake operating mechanism is arranged. In some cases there are short shafts with universal joints arranged between the brake drum and the chassis in such a way as to actuate the cam directly when the shaft is turned by a lever at its inner end.

In some cases the brake camshaft is attached to the front axle and terminates in a cam which lies in the axis of the knuckle pin. In other cases a camshaft on the front axle is used to operate a linkage consisting of a rod which passes through the axis of the steering knuckle pivot and operates an arm on the short shaft which carries the brake cam. Still another group is operated by cables which are attached either to the front axle and various actuating parts, or to a brake lever or pulley on the knuckle pivot or brake drum.

The attorney mentioned states that there is no one patent dominating this development, and that it is quite possible that commercially satisfactory brakes could be designed without infringing any of the patents already issued. However this may be, it is undoubtedly wise for the manufacturer who contemplates using front wheel brakes to give existing patents careful study before proceeding too far with a development intended for production.

In addition to the American patents, there are a large number of foreign patents, disclosures of which parallel to a considerable extent the United States patents.

Market Study Helps Purchasing Agent

MARKET analysis does more than give the sales manager a sound basis upon which to conduct his operations. It allows the purchasing agent to anticipate material demands and to buy in quantities best suited to the future needs of production. If the sales force can determine by thorough and logical study how many cars will have to be produced during the next six months, the purchasing agent can buy materials on a far more favorable basis than would otherwise be possible.

Purchasing is done on the basis of sales quotas in only a very few instances. This is natural because few quotas are scientifically built up at the present time. If purchasing agents bought material confidently on the strength of what the sales department told them would be the distribution for the next twelve months, anything might happen. It is safe to say that few buyers in the automotive plants dare place confidence in sales estimates so far as actual purchasing of parts and material is concerned.

If careful study of markets and current economic trends had been the rule in 1920, few manufacturers would have found themselves with expensive inventories piled high. Much water has gone under the bridge since 1920. Study of markets and business trends has become more common, but it is still far from being an exact science.

Sales are determined basically by the power of the market to absorb cars and trucks; not by the capacity of manufacturing plants. It is sound business to adjust manufacturing facilities to market possibilities, rather than to try the opposite adjustment. A correlation of marketing data with current industrial trends is the best possible safeguard against unbalanced inventories.

Economic Ideas Endorsed

THE American delegation to the Convention of the International Chamber of Commerce at Rome secured the adoption of a resolution which calls for "the enlargement of production of every invention and mechanical device which offers economy of production" and "the elimination of all artificial restrictions prescribing the amount of work to be done or the output to be rendered by each worker in other lines of industry as now prevails in agriculture" as well as for the "stimulation of individual effort by personal remuneration based on relative individual output."

It is interesting to note that these economic principles which have been endorsed by the business men of the world already are in effect in the American automotive industry.

HENRY FORD'S announcement of a sort of Christmas savings plan to make motor car buying easy, seems sound. It will put automobiles in the hands of a great many persons who wouldn't otherwise get them and it means cash sales, for deliveries aren't made until the fund equals the purchase price. A certain amount of credit in retail sales is desirable, but there seems to be rather too much of it at present. Not all the sales are justified.

PROBABLY half a million motor cars have changed hands in the last six months, new and used. A very large proportion of them were run but little in the winter months because of the unusually heavy snows. What will happen when all the usable cars get out on the roads is an interesting speculation. Congestion was so great a year ago, in the vicinity of large centers of population, that driving was a burden rather than a pleasure. It's likely to be much worse this season.

OBSERVATION of more than 100,000 motorists driving over its tracks at grade crossings has led the Pennsylvania Railroad Co. to the conclusion that carelessness is responsible for nearly all the fatal accidents at such dangerous points. It was found that 97 per cent of the drivers were reasonably careful but that the remainder displayed marked and even criminal negligence. It may be another case of a railroad "passing the buck," but it emphasizes again the fact that most highway accidents are caused by a comparatively few reckless motorists.

Plants Follow March in Output Schedules

Little Likelihood That April's Daily Average Will Exceed Last Month's

NEW YORK, April 9—Following a month of unprecedented operations, major automobile manufacturers are moving along on approximately the same schedules as those pursued in March. There will be increases during April in the programs of some of the smaller producers, but it is not likely that the average daily output in the industry will be much above that maintained last month. Difficulty in obtaining a sufficient supply of material to make expansion possible will limit output considerably under the actual demand.

March was a surprising month and exceeded the most liberal estimates on the probable output. With a total of 346,000 cars and trucks it advanced to first position in the production history of the industry, surpassing the best previous month by 20 per cent and forging ahead of February of this year by 26 per cent. The first quarter of the year produced 128 per cent more cars and trucks than did the same period a year ago, and in March alone there were manufactured 90 per cent as many vehicles as in the entire first quarter of 1922.

Product Is Being Absorbed

All the output is being absorbed as fast as shipping facilities can deliver it. Stocks in dealers' hands have been depleted and retailers have been pressing the factories for immediate replenishment. The opening of boat service on the Great Lakes the first of this month will prove an important factor in expediting deliveries and relieving dealers' books of long standing orders.

Excellent retail conditions are reported throughout the country with the improvement most notable in agricultural sections. A survey of leading distributing centers indicates that sales will continue at a high level this month and next, at least, which, with back orders on hand, will insure capacity operations for the larger plants well up to July.

A pronounced forward movement is featuring truck demand, with interest centering on the lighter vehicles, although business in the heavier duty trucks is reported to be satisfactory. The truck branch of the industry is feeling in a marked degree the stimulus of spring buying. Replacements form a fair proportion of the business, but there is an encouraging number of new owners entering the market. More extensive purchasing on

(*Continued on page* 849)

Business in Brief

NEW YORK, April 12—Industry has continued to work at top speed, and the jobbing trade has maintained its healthy state. Retail business has gained in sections of the country where improvement in weather conditions has permitted.

Increased conservatism has developed in various business circles, indicating that cautionary signals have not been completely overlooked. This tendency is reflected in a quieting down in textile and metal buying. Sellers and buyers alike are showing some hesitation. Postponement of buying is having its effect in quieting the market.

Farm work has been delayed by unfavorable weather in many States, and in others crop growth has been retarded. Freezing weather has damaged crops in southern Texas and in some midwest States. Erratic fluctuations characterized the Chicago wheat market last week.

Car loadings for the week ending March 24 aggregated 917,036 cars, an increase of 12,750 cars over the previous week.

All monthly records of pig iron production were broken in March with an output of 3,521,275 tons.

The stock market for the week was unstable due to heavy bearish selling. Rails and speculative industrial shares suffered the greatest decline. The bond market was generally firm, but naturally felt the weakness of the stocks.

Jewett Radio Acquires Business of De Forest

DETROIT, April 9—The De Forest Radio Telephone & Telegraph Co. has been taken over by E. H. Jewett, president of the Jewett Radio & Phonograph Co. of Detroit. Jewett is also a director of Paige-Detroit Motor Car Co. Associated with him in the purchase is H. M. Jewett, president of the Paige company. Others identified with the purchase are Theodore Luce and Frank W. Blair.

The purchase includes the De Forest plant at Jersey City, N. J., with 181 radio patents. Dr. Lee De Forest will remain with the company under a long time contract as consulting engineer.

Liberty Plant Sale Is Again Postponed

Reorganization Rumored, with Percy Owen Continuing in Control of Company

DETROIT, April 10—The sale of the Liberty Motor Car Co. property by the receiver, scheduled to take place today, was postponed to April 24 at the request of Henry B. Joy, president of the National Bank of Commerce, sole qualified bidder.

In continuing the sale it became known that Joy had been in touch with others interested in keeping the property under the guidance of Percy Owen and that it is expected they will perfect their plans for the reorganization within the next two weeks.

Dealer Interest Aroused

The announcement that Joy was behind the movement to refinance the company and get it back on its feet has had the effect of arousing much dealer interest. Distributors remaining with the company and many who have changed to other lines are reported to be lining up. Many orders have been placed for immediate delivery pending the outcome of the sale.

No hint can be given of the plans of the company, but it is understood that the line will be changed in some particulars and that new production methods will be installed under the direction of a new manufacturing executive.

Gotfredson Will Build Truck Line in Detroit

DETROIT, April 9—The Gotfredson Truck Corp. has been organized in Detroit as an offspring of the Gotfredson Truck Corp., Ltd., of Canada, to manufacture a specialized unit vehicle for general distribution in the United States. The officers of the American company are Benjamin Gotfredson, president; M. H. Coleman, secretary, and Robert B. Gotfredson, vice-president and general manager.

The company will make a full line of trucks ranging from one to five-ton capacity. The American truck will differ somewhat in specifications from the Canadian vehicle to meet different conditions, but on the whole will be similar to the vehicle which has been made in Canada for a number of years. The models are one, one and a half, two and a half, four and five-ton.

Branches of the Canadian company are located at Hamilton, Toronto, Montreal and London, England, with factory at Walkerville. The Detroit factory is at 3601 Gratiot Avenue. This has just been taken over, and the company is now getting into production. As production is increased, it is planned to extend distribution to all parts of the country.

Christmas Club Plan Used to Sell Fords

Sum of $5 Deposited in Local Bank Will Start Fund for Purchase of Car

DETROIT, April 10—The Ford Motor Co. has taken an important step forward in the merchandising of motor cars by introducing a savings system which is designed to help the accumulation of a down payment on a car by a person who has never saved enough previously to make a down payment. In inaugurating the system the company has obtained the cooperation of banks in every city of the country to work with its dealers in making the plan a success.

Instant Response Reported

The system became effective yesterday, and in the first few hours of its operation the factory sales offices were informed by the Detroit retail sales organization of the instant response of the public. No definite statement can be made on the extent to which business will be increased by the plan, but the company declares it expects it to be instrumental in making car owners of practically every family in the United States.

Development of the plan has been in progress over a period of months, and even this week there are minor changes to be made to place it in definite form. Some difficulty was experienced in some sections in obtaining bank cooperation, but this has been cleared away and the plan takes immediate life in every part of the country. The formulation of the plan, the general supervision of its workings and the obtaining of bank indorsement have constituted and will continue to constitute the factory's participation in it. The following through will devolve upon the dealer and banker.

Personal Ambition of Ford

In making its announcement, the company said:

For many years it has been Henry Ford's personal ambition to make the Ford the universal family car—to put it within the reach of the millions of people who have never been privileged to enjoy the benefits of motor car ownership.

During the past fifteen years over 7,500,000 Ford cars have been placed in the hands of retail customers, more than a million and a half of them within the past twelve months, yet there are still millions of families who are hopefully looking forward to the day when they can own a Ford.

And now the way is open.

Under the terms of this plan you can select your Ford car, set aside a small amount each week and you will be surprised how soon you will own it. In the meantime your money will be safely deposited to your credit in one of the local banks, where it will draw interest

Think it over. Five dollars will start an account. The whole family can participate in it—father, mother, brothers and sisters, each doing a little.

And why not start today? Step in and talk it over with your local Ford dealer. He will be glad to fully explain the details of

(*Continued on page* 848)

With Efficient Sales Organization Good Business Should Continue Throughout Year

By C. C. HUTCHINSON,
Sales Manager of the Hupp Motor Car Corp.

Detroit, April 10.

THERE is no let-up in sight for the stream of business which the industry is now enjoying, for at least this second quarter of the year. After that there will still be plenty of business but it will be a matter of organized selling and the companies which have efficient sales organizations will get it.

April and May have always been the industry's two largest months and it is certain they will be just as big this year as ever. From every section of the country there is a strong continuing demand which is exceeding considerably factory production facilities. Within the past week we have had requests from distributors in twenty-seven distinct localities for more cars than their early year allotments.

There is no reason for worry on the part of dealers about the continuance of the present selling movement. Distributors who have studied their territories carefully are in position to know absorption possibilities and they say present business is well within their calculations for the year.

Used cars are selling in very much the same quantity as new cars; it is all part of the same demand. As an instance of this one of our distributors with a business of over $600,000 in March had a stock of about $20,000 in used cars at the end of the month. We do not know of any territory where dealers are experiencing unusual difficulty in selling cars accepted in trade.

Heavy snows in the middle and northwest which are holding back business temporarily in those districts are adding millions of dollars to the crop value possibilities of the year. Snow was just what these districts needed and distributors in those sections report the storms the heaviest in years.

Buying from the farm districts in the third quarter will make it one of the most important of the year. Up to the present time the business has come largely from the cities. As better weather appears and road conditions outside the cities improve there will be a large increase in buying from smaller cities and towns. This business will come during the second quarter.

The ability of the industry to keep prices low in this period of rising prices will have an important effect on continued capacity business. Although price increases could be put into effect without a perceptible change in the present buying attitude, over a long period the tendency would be to decrease the market, and in the latter quarters of the year there might be a considerable slowing down.

The industry has only been able to withstand the effect of increased material costs by large increases in production. Higher car prices may be made necessary at any time but by holding them to reasonable limits it is quite certain that the large part of the buying public will reconcile them with the rising costs in all commodities.

There can be no thought of taking advantage of the situation but neither can the industry afford to operate at a loss.

Miniger Takes Option on Willys' USL Stock

TOLEDO, April 11—Clement O. Miniger, president of the Electric Auto-Lite Co., has taken a ninety-day option on the preferred stock issue of the U. S. Light and Heat Corp. of Niagara Falls, N. Y. The stock under option is now held by the Willys Corp. of which the battery company was a part.

Miniger will try to reorganize the company during the period of the option. The "USL" plant is now employing 1100 workers.

Huffman Receiver Named on Bondholders' Petition

ELKHART, IND., April 10—Upon application of bondholders the Superior Court of Elkhart County has appointed a receiver for the Huffman Bros. Motor Co. The action was taken to conserve the assets of the company pending reorganization and refinancing during which the company is continuing to operate without change in management.

Earl R. Huffman, treasurer and general manager, says that the production and sale of trucks is continuing as before and that there will be no change in policy. The cause of the receivership, he says, is not due to present conditions but dates to a previous receivership during which the company became delinquent in its payments on an outstanding bond issue of $165,000 and has not yet caught up.

Paige Drops Trucks Due to Car Demand

Company Will Devote All Its Facilities to Production of Automobiles

DETROIT, April 10—Manufacture of Paige motor trucks has been discontinued by the Paige-Detroit Motor Car Co., according to an official announcement, which states that the abandonment of the commercial vehicle field has been forced by the rapidly increasing demand for Paige and Jewett passenger cars, which requires every effort on the part of the company to increase production in this field.

"This will enable the company to devote all its facilities to passenger car production," says the announcement. "Despite extensive additions to factory floor space in the past year, it was found impossible to satisfy the demands of the Paige-Jewett dealers, although the Paige plant has been working to capacity all winter. The present move is expected to offer material relief.

"The company's service department will continue to service all Paige trucks as in the past."

Paige trucks have been on the market for the past four years, the company branching out in this field in the last year of the war. When the passenger car business became brisk again in 1920 there was a let-up in truck activities and since that time not many Paige trucks have been produced, the company centering its activities on passenger car production.

There were three models in the Paige truck line. The one and one-half ton model listed at $1,950, the two and one-half at $2,420 and the three and one-half at $3,145. The line was merchandised through dealers handling the Paige passenger cars.

Preston Motors Working Toward Reorganization

BIRMINGHAM, ALA., April 9—Efforts are being made to reorganize the Preston Motors Corp., which recently went into a receivership. At present the receiver is engaged in making an appraisal and audit. The company's balance sheet as of Dec. 31, 1922, shows current assets of $151,417 and current liabilities of $175,678.

Correction is made of the statement published in AUTOMOTIVE INDUSTRIES, March 22, which said that prior to March 1, $2,000,000 was transferred to certain creditors. This sum was $2,000, it is claimed.

ITALY LOWERS BEARINGS DUTY

WASHINGTON, April 11—The import duty on ball and roller bearings has been reduced by the Italian government, according to a cablegram received by the Department of Commerce from Commercial Attache H. C. MacLean at Rome. Bearings weighing more than four kilos are now dutiable at one gold lira per kilo; those weighing less than 50 grams, at 10.40 gold lire per kilo (formerly ranging from one to 14.40 gold lire per kilo); loose balls, with a diameter in excess of 16 millimeters, are now dutiable at 2.10 gold lire per kilo; those with a diameter of three millimeters, at 10.80 gold lire per kilo (formerly ranging from 3.60 to 10.50 gold lire per kilo.)

Spring Service Meeting Will Take Place in May

NEW YORK, April 11—The spring convention of the Service Managers Division of the National Automobile Chamber of Commerce will be held May 15 and 16 at Detroit.

Two prominent speakers will introduce the leading subjects, one each day. The subjects will deal with educating the dealers, service personnel and car-owning public, flat rates and the part that service plays in advertising.

Fred J. Wells of Pierce-Arrow is chairman of the service committee, Harry R. Cobleigh, secretary, and W. M. Warner of Cadillac, L. C. Voyles of Marmon, A. B. Cumner of Autocar and F. A. Bonham of Durant and Star are members.

Instead of being held in a hotel, as has been the custom, the convention will take place in the General Motors Building.

Enlarged Peerless Plant Will Operate at Capacity

CLEVELAND, April 9—In his annual report which shows that the Peerless Truck & Motor Corp. turned a deficit of $103,665 at the close of 1921 into a profit of $1,005,112 for the year ending Dec. 31, 1922, President R. H. Collins announces that for the first quarter of 1923 more than twice as many cars were sold as during the same period a year ago. Before April 1 the company had on hand for April delivery orders for 1130 cars, including 250 open models. Capacity operations of the recently enlarged plant will be necessary to handle this business, he declares.

The expansion program adds about 50,000 sq. ft. to the company's plant. It includes new loading docks entirely enclosed, making it possible to load cars for shipment in all kinds of weather without damaging them. Considerably larger storage facilities both for raw materials and completed cars also have been provided.

TO MAKE CHECKER BODIES

SPRINGFIELD, MASS., April 11—The Auto Metal Body Corp. has taken a contract to manufacture bodies for the Checker Cab Co., and will start producing them soon at the rate of fifteen a day. The making of Hupmobile bodies, carried on here for several years, has been discontinued by the Auto Metal Body Corp.

First Quarter Made Record in Cleveland

Manufacturers, Distributors and Dealers Report Previous Marks Exceeded

CLEVELAND, April 11—The Cleveland automobile industry had the best quarter year in its history during the three months ending April 1.

Although March shipments from the factories and sales by distributors and retailers were larger than in any other month of the year, April has started out with a rush of business that indicates the volume will be at least 20 per cent greater than it was in March.

During the slow months most of the factories by rearrangement of distribution, putting in conveyor systems and interior remodeling were put on a more productive basis, so that today more cars are being produced without expansion of space.

Dealers from the small towns in the Cleveland district, who have been in Cleveland recently, report that there is no indication that the usual growth of sales during April, May and June will not take place this year. They report that the people in their territories are working, wages are high and factories are all busy on orders that will keep them occupied for several months.

April Sales Ahead of March

In the city of Cleveland, April sales are going far ahead of those of March.

Peerless, Jordan, Stearns, Chandler and Cleveland all have had a larger quarter this year than they did last, and it also is true that the record established in the same quarter of 1920 was exceeded.

Winton conducted a nation-wide sales contest with very good results, and business has been good. Templar, which was placed in the hands of a receiver some time ago, is being operated, with an inventory gradually being worked down. Grant, also in the hands of a receiver, is being operated, and its inventory is being reduced. It also has received an impetus in orders during the quarter just ended, and April sales are larger than in March.

Old Kentucky Wagon Co. Sued on Eight Notes

LOUISVILLE, KY., April 7—Allegations that the present assets of the Kentucky Wagon Co. are not sufficient to meet the obligations and that the transfer of the company to the National Motors Corp. was fraudulent were contained in the petition of the Phoenix Coal Co., filed in Circuit Court today in a suit for $5,773.

The plaintiff made both the Kentucky Wagon Manufacturing Co. and the National Motors Corp. defendants in the suit, claiming both were responsible for the indebtedness on eight notes.

Receivership Sought for Lexington Motor

Petition Alleges Company Is Insolvent, with $3,470,000 as Liabilities

INDIANAPOLIS, April 12—A receiver for the Lexington Motor Co. of Connersville, Ind., was asked in a suit filed in Federal Court here yesterday by the Jacques Manufacturing Co. of Wilmington, Del., manufacturer of automobile bodies, on a judgment for $59,342.

The petition alleges that the Lexington company is insolvent, with assets of $1,794,000 and liabilities of $3,470,000. Argument on the hearing will be heard by Judge A. B. Anderson on April 28.

Committee Has Been in Charge

The financial difficulties of the Lexington company have been serious for several months. A creditors' committee has been directing operations for a considerable period with a trustee in charge of the plant. Merchandise creditors have been making shipments on open accounts to the trustee in the hope of averting court proceedings and keeping the plant in operation.

The current liabilities approximate $1,350,000, of which only $220,000 is due to banks. Accounts payable aggregate $827,000, and notes and acceptances payable, $313,000.

Issuance of $1,500,000 in first mortgage bonds was authorized on March 1, 1922. They were to carry interest of 7½ per cent and were due March 1, 1934. The sale of these bonds was undertaken by the New York banking house of Harvey Fisk & Son, but considerable difficulty was experienced in disposing of them and only a third of the issue was sold. Inability to dispose of the entire issue brought the financial affairs of the company to a crisis.

F. B. Ansted, president of the company, has made every effort to dispose of the remainder, but has met with indifferent success. He has worked night and day for months on plans which he was hopeful would ward off a receivership and provide the company with much needed working capital.

Part of U. S. Automotive Corp.

The Lexington company is a part of the United States Automotive Corp., which owns all the outstanding capital stock of the Ansted Engineering Co., the Ansted Spring & Axle Co., the Connersville Foundry Corp., the Fayette Painting & Trimming Co. and the Teetor-Hartley Motor Corp., as well as Lexington.

W. C. Durant contracted with the Ansted Engineering Co. to supply him with Ansted engines for use in the Durant six, and it was reported two months ago that he was negotiating for the purchase of this company. An agreement on terms could not be reached, however. It is understood that Durant advanced the company $396,000, for which he accepted mortgage bonds as security.

The proceeds from the sale of the bonds authorized last year were expected to make available for working capital the money owed Lexington by the Ansted Engineering Co. and provide additional funds for general corporate purposes.

The Lexington company received the mortgage on the Ansted assets in payment for advances made to it by Lexington during the development of the Ansted engine.

The stock of the company outstanding consists of $1,700,000 in common and $600,000 in first preferred. The authorized common stock was changed in May, 1922, from 6000 shares of $100 par value to 500,000 of $5 par value. Six thousand shares of second preferred have been retired to the treasury in exchange for 120,000 shares of the $5 par value common.

A further issue of 120,000 shares of the $5 par common was made in exchange for the previously outstanding 6000 shares of $100 par common and 100,000 shares of the common were issued for the purchase of the assets and liabilities of the Fayette Painting & Trimming Co.

All the plants of the United States Automotive Corp. are located in Connersville, except that of the Teetor-Hartley company, which is at Hagerstown, Ind. Practically all the directors of the holding corporation are residents of Connersville.

Officers of Company

The officers of the Lexington Motor Co. are: President, F. B. Ansted; vice-president, C. C. Hanch, G. W. Ansted, F. I. Barrows and Emery Huston, and secretary and treasurer, LeRoy A. Hanson.

No information is available here as to what effect, if any, a receivership for the Lexington company would have on the United States Automotive Corp. and its other units.

Through its relationship with the various other subsidiaries, the Lexington company has been able to turn out a car for which the United States Automotive Corp. made most of the essential parts.

The Lexington company made 3500 cars last year. Output in January this year was eighty cars and it was the same in February, but it fell to forty in March.

Bankruptcy Petition Filed

NEW YORK, April 12—Simultaneously with the filing of the petition for the appointment of a receiver for the Lexington Motor Co. in the Federal Court at Indianapolis yesterday, an involuntary petition in bankruptcy was filed in the United States District Court here against the Lexington Motor Car Co. of New York, Inc., by three creditors with claims aggregating $3,874. It is alleged the liabilities amount to $150,000 and the assets to $40,000.

Suit Started Asking Duesenberg Receiver

Charges by Stockholder of Mismanagement and Insolvency Denied by Company

INDIANAPOLIS, April 12—Peter A. Pfister, a stockholder, has filed suit in the Superior Court asking for the appointment of a receiver for the Duesenberg Automobile and Motors Co., of this city, alleging the company is mismanaged and insolvent.

Following the filing of the suit, President L. M. Rankin issued a statement, denying the charges made by Pfister and declaring the financial condition of the company was unimpaired.

The Duesenberg company was formed March 8, 1920, acquiring from Fred S. Duesenberg all patents involved in the manufacture of the Duesenberg Straight Eight passenger car, including engine, axle and hydraulic four-wheel brake patents. The authorized capital of the company is 100,000 shares of common of no par value and $5,000,000 8 per cent cumulative preferred, par $100. Last May the company offered $3,000,000 8 per cent cumulative preferred stock at $100 a share, with one-half share of common as a bonus, the proceeds to be used in plant expansion.

The personnel of the management includes L. M. Rankin as president and James McElhinny, secretary-treasurer. General Manager Chester S. Ricker and Sales Manager F. C. Scudder are among the directors.

Bid for Standard Parts Revives Talk of Merger

CLEVELAND, April 12—Attorney W. D. Turner of the law firm of M. B. and H. H. Johnson today bid $1,300,000 for the Eaton axle, American axle and Hess spring and axle plants of the Standard Parts Co. of this city, the $20,000,000 automobile accessory manufacturing concern that is in process of liquidation. Receiver F. A. Scott asked the United States District Court here whether the bid should be accepted.

Turner inclosed a certified check for $130,000 and promised to pay the remainder in installments extending over six months. He declined to state whom he represented.

The bid revived talk heard here last winter that negotiations were pending for the merging of several lines of automobile accessory manufacturing plants.

PANDOLFO BEGINS SENTENCE

CHICAGO, April 9—Samuel C. Pandolfo, promoter of the Pan Motor Co. of St. Cloud, Minn., surrendered to the United States Marshal in Chicago Saturday and was taken that night to the Federal penitentiary at Leavenworth.

Import Duty Levied by Irish Free State

Government May Grant Preference to Automobiles of English Manufacture

LONDON, March 29 (*by mail*)—The Government of the new Irish Free State has decided to impose an import duty on all cars entering its territory after April 1.

The decision has come as a thunderbolt to Irish traders and British manufacturers and presumably also to importers of European and American cars who have distributed from England the cars sold in Ireland. It had been hoped that, as Ireland has no automobile industry, apart from the Ford plant at Cork, the new government would have adopted a policy of free trade in respect to cars.

Provided For in Constitution

According to President Cosgrave, the legal position is laid down in the Free State Constitution, and until the article bearing on this matter is altered or repealed the import duty must be imposed. In any event, the government was inclined to retain the duty in order to secure additional revenue.

It is, however, possible that English automobile products will be granted some measure of preference, such as is granted by England to imports from its Colonies—a reduction of one-third of the import duty. It is considered doubtful, nevertheless, whether even a concession of this kind would enable English cars to retain their hold on the market of Southern Ireland.

An important point with which American and European cars are concerned is whether these, when they are as now in most cases sent to English distributors for transhipment to Ireland, will be subject to the two import duties—British and Irish—without recovery, or whether the British Government will allow a "drawback" on the duty paid when the cars are sent forward. At present such drawbacks cannot be obtained.

American Firms Affected

Speculation is rife as to the future policy of General Motors, Overland and other American firms who have established assembly depots in England. Will General Motors, for example, supply Southern Ireland direct from Canada and assemble cars there, distributing to Northern Ireland (Ulster territory) from London, as now? Fiscally, Northern Ireland is still a part of the United Kingdom and seems likely to remain so.

Then, too, there has arisen a good deal of speculation as to how this new state of affairs will affect the Ford factory at Cork. Although it is understood that the energies of that plant are mostly devoted to tractors, it is believed that a number of parts of the Ford car are also made there and sent to England. If that continues—or in any event—the Cork factory will be outside the British tariff wall, as it may be presumed that if English-made cars and parts are dutiable on entry into Southern Ireland, Irish-made Ford parts will not be exempt upon entry into England—they will be regarded as "imports from abroad," which will be the status of all kinds of Irish products after April 1, so far as port dues are concerned.

At the moment the general position is not so serious as it would have been if Southern Ireland had been in a normal state. Owing to its present and past unsettled condition, comparatively few cars are being imported.

"HIGHWAY TRANSPORT" MEANING EXPLAINED

WASHINGTON, April 9—Interpreting the meaning of "highway transport" for high school students participating in the annual essay contest conducted by the Highway Education Board, Thomas H. MacDonald, chief of the United States Bureau of Public Roads says:

"Highway transport, or highway transportation, deals with the movement of persons and things over the highways and has to do with the instruments of transportation, the highway and the vehicle, as well as the services rendered by these transportation instruments."

Highway transport, therefore, embraces not only the automobile and the motor truck, but implies the use of these vehicles for the transportation of passengers and commodities over the roads. The contact of the two, the vehicle and the road, constitutes highway transport.

Willys-Overland Opens Kitchen for Employees

TOLEDO, April 11—The industrial relations department of the Willys-Overland Co. has installed in one of the units of the factory a new employees' commissary kitchen, which will have forty steam-table stations throughout the factory and be capable of preparing warm lunches at cost for 10,000 employees.

President John N. Willys and members of the official family opened the kitchen with a luncheon there.

The housing situation at Toledo is causing concern here. Labor has been recruited from many outside towns and cities, and extraordinary means are being taken to obtain living and boarding quarters for men and their families.

A special department has been organized to deal with housing problems, and citizens of Toledo have been appealed to for help in taking care of men needed for the industry.

Employment Reaches High Mark in Toledo

Electric Auto-Lite Makes Greatest Gain with 1085 Additional Workers

TOLEDO, April 9—Automotive plants here brought the employment record of the city to a new high point at the close of March with a total of 27,549 employees in the twenty-one plants normally employing 500 or more which make reports to the Government.

This is a gain of 1337 employed, as compared with February.

The Electric Auto-Lite Co. showed the greatest gain with a total of 3335 at work last month, compared with 2250 for February. The plant is well booked with business for the coming year.

Willys-Overland added 300 men, while a few of the other plants reduced forces slightly to even out their schedules. The Milburn Wagon Co., which has moved to its Grand Avenue plant increased its force slightly during the month.

More Workers in Cleveland

CLEVELAND, April 9—Reports received by the labor relations committee of the Cleveland Chamber of Commerce from 100 local factories show an increase of 2.4 per cent in the number of employees during March. The committee says there are indications that the number of workers in these factories has about reached the peak.

The eighteen local factories that manufacture automobiles, parts and accessories that reported to the committee increased their working forces 1.6 per cent during March.

The average rate for unskilled labor rose nearly a cent and a half during March. It is now 40.7 cents an hour, as compared with 39.3 cents during February. Thirty-five firms expect to increase wages during the month of April.

Men Who Plan Cities to Hear Motor Needs

NEW YORK, April 9—The National Conference on City Planning, which will be held in Baltimore April 30, May 1 and 2, will have a motoring trend, three of the papers scheduled having a direct bearing on the industry.

Hugh E. Young of the Chicago City Planning Board will address the meeting on "Day and Night Storage and Parking of Automobiles," and John C. Long of the National Automobile Chamber of Commerce will lead the discussion, aiming to give the views of the automobile makers and owners.

George B. Ford of New York will speak on "Principles of Regional Planning." George A. Damon of Pasadena, Cal., is scheduled to discuss "Inter and Intra Urban Transit and Traffic as a Regional Planning Problem."

No Unfavorable Laws Passed, Says Meixell

More Than Half of State Legislatures Have Completed Their Work

NEW YORK, April 9—Of the forty-three State Legislatures that convened this year, twenty-five have completed their labors, eighteen still are in session, and so far no measures have been enacted into laws that are at all inimical to motoring in general and the automobile industry.

This, in a nutshell, sums up the situation as seen by Harry Meixell, secretary of the Motor Vehicle Conference Committee, which represents the National Automobile Chamber of Commerce, Motor and Accessory Manufacturers' Association, Rubber Association of America, National Automobile Dealers' Association and the American Automobile Association, whose duty it is to watch legislation in general and to cooperate as far as possible in aiding legislators to act intelligently on bills pertaining to motor vehicles.

Special Pamphlets Help

As Meixell sees it, so far there has been little legislation contravening the fundamental principles advocated by the committee, and it is felt that the three pamphlets prepared by the committee, "Special Taxation for Motor Vehicles," "State Regulations of Motor Vehicle Common Carriers," and "State Restrictions of Motor Vehicle Operation," have been most effective.

The committee has sent 25,000 sets of these throughout the country, reaching every member of the legislatures, chambers of commerce, boards of trade and executives of every dealers' and users' organization. These pamphlets contain the views of the organizations making up the committee and have been of great help, it is said, in enabling legislators to get a proper perspective.

More than 2000 bills dealing with motor vehicles directly and indirectly have been introduced bearing on common carriers, gasoline taxes, size, weight and speed restrictions, compulsory insurance, compulsory stoppage at grade crossings, compulsory equipment, fees and taxes, anti-theft and numerous highway measures.

Few Gasoline Bills Passed

About eighty bills on gasoline taxes have been filed, and of this number few have been passed. Not more than six States at the most have increased gasoline taxes or added them. Common carriers have come in for considerable attention, and while the tax provisions imposed have been drastic, yet none of the measures is considered bad legislation from the motorists' viewpoint.

Legislation for compulsory insurance seems to have failed, for of about fifty bills introduced seeking to compel such insurance, none that affects the owner has been adopted. Size, weight and speed restrictions have not been startling. Unlike 1921, relatively few bills have come up for consideration, and not many of these have got as far as the Governor.

In the matter of headlight legislation the tendency has been toward the standard set up by the Society of Illuminating Engineers and in the direction of uniformity. Few have been acted upon.

CHICAGO MAY PROVIDE MORE ROOM FOR SHOW

CHICAGO, April 9—An increase of 50 per cent in the floor space probably will be available for the next Chicago National Automobile Show at the Coliseum, according to an announcement by the Coliseum management. This would be accomplished by the installation of a removable second story floor with 50,000 sq. ft. of floor space. The present available space is 100,000 ft.

Plans of the management contemplate installation of a crane beneath a removable portion of the first floor by means of which it would be possible within twenty-four hours to put in place the sections of the second floor. Likewise the second floor could be as readily removed and stored in the basement.

Final determination of the improvement will depend upon whether enough exhibiting lessees of the Coliseum agree to use the additional space, paying a proportional rental therefor. The management states that already the National Automobile Show and the "Own Your Own Home Show" have agreed to take the additional space. Others are being canvassed to determine their attitude.

AUTO-LITE SALES INCREASE

TOLEDO, April 9—Production of Auto-Lite starting and lighting equipment for the month of March totaled approximately 80,000 complete units, according to an announcement by President C. O. Miniger, who states that plans for the second quarter indicate an even greater volume of business each month as compared with the first quarter.

TRACTOR MODELS DROPPED

CHICAGO, April 9—The International Harvester Co. has revised its schedule of tractor models so that hereafter it will include but two types, the 15-30 and the 10-20. They will be marketed as the "McCormick Deering" instead of the "International" and "Titan," respectively, as heretofore. The "International" 8-16 and the "Titan" 15-20 will no longer be manufactured.

Battery Standards Form Base of Study

Simplified Practice Committee Will Investigate That Subject First

NEW YORK, April 10—Battery dimension standards will be the first subject investigated by the Automotive Simplified Practice Committee, which held a meeting in New York City today. The purpose of the committee is to promote the idea of standardization and simplification and to extend in any way possible the use of standards in existence at the present time.

The committee resulted from a conference called at Washington by the Division of Simplified Practice of the Department of Commerce several weeks ago. M. L. Heminway, general manager of the Motor and Accessory Manufacturers' Association, was made permanent chairman of the committee at that time and has since appointed the following members:

Members of Committee

S. S. Bradley, Aeronautical Chamber of Commerce; Azel Ames, American Automobile Association; G. D. Mitchell, Automobile Body Builders' Association; A. D. T. Libby, Automotive Electric Association; R. W. Procter, Automotive Equipment Association; A. W. Herrington, Motorcycle & Allied Trades Association; Don Whittaker, Motor Truck Industries, Inc.; F. E. Moscovics and D. C. Fenner, National Automobile Chamber of Commerce; C. B. Warren, National Automobile Dealers' Association; E. V. Hennecke, National Hardware Association; A. L. Viles, Rubber Association of America and Coker F. Clarkson, Society of Automotive Engineers. D. C. Fenner was named vice-chairman.

The committee has decided to concentrate its efforts on a few specific activities. The subject of battery dimensions is being chosen for primary attention because the results of a questionnaire sent out recently by the N. A. C. C. indicate possibilities for constructive action in this field.

Questionnaire Developed Information

The questionnaire developed information as to the extent of use of S. A. E. battery standards, whether or not there are any particular objections to the standard as it now stands, and the reasons for failure to use it at present. Replies came from eighty-one car and truck builders and from fourteen battery manufacturers.

The results of the questionnaire are to be analyzed and correlated by a committee composed of A. D. T. Libby and G. R. Lundane. Their analysis will be presented to the next meeting of the committee, which is scheduled for May 10.

Alabama Prosperity Opens Way for Sales

Industrial Sections of State Still Present Best Outlook for Business

BIRMINGHAM, ALA., April 11—With the entire State of Alabama showing the greatest prosperity it has enjoyed since the World War, the industrial sections still present the best sales outlook for automobiles, this being particularly true of the iron, steel and mining districts.

Birmingham is almost leading the entire country according to the reports of national agencies. This is evidenced by the fact that the bank clearings for the week ending March 22 went to the high percentage of 73.3 ahead of the same week last year, and led the country in increase, Memphis being second and Galveston third.

Bank Clearings Move Forward

The week before this Birmingham was a close second to Galveston in percentage of increase of clearings. The day following the report of the week ending March 22, Birmingham went 82.3 per cent ahead of the same day last year in clearings. The indications are that March has set a new high record for a single month in bank clearings in Birmingham, March 28 being ahead of Jan. 27, a comparative date.

The increase in the production of pig iron in the Birmingham district is figured to be slightly more than 100 per cent over that of the same period during 1922. Two additional furnaces were blown in during the last part of March. One of them belonging to the Tennessee Coal, Iron & Railroad Co., a subsidiary of the United States Steel Corp., has been out of blast for five years. These two furnaces give the iron producers of the district the hope that the production will go ahead of the peak production attained during the war period.

Building activities in Birmingham are still on the upgrade, and March set a new record on the 27th of the month, with four days to go, and on the 28th went past the million and a quarter mark, according to building permits issued by the city. March 22 permits had been issued for 241 residences at a listed price of $489,500.

Increases in Wages Made

Wage increases have been granted the miners and workers in mines of the coal and ore sections of Alabama. The first pay day in which they were effective was March 31. This is expected to help general conditions.

The general boom in the industrial sections of Alabama affects not only Birmingham and Jefferson County, in which this city is located, but several other counties in North Alabama.

Etowah County, in which Gadsden, Attalla and Alabama City are located, is the center of considerable iron and steel activities. At this place the Gulf States Steel Co. operates its steel mill, wire mill, wire fence mill and nail mill. This concern is booked up with orders and is making large shipments to Cuba, South America and the Pacific Coast, as well as to a number of other foreign and domestic markets.

Calhoun County, in which Anniston is located, plays a large part in the iron and steel activities of Alabama. They have large steel plants of various kinds and all are well loaded with orders.

Muscle Shoals Helps

The tri-cities Tuscumbia, Florence and Sheffield and their near neighbor, Russellville, are also affected by the mining and iron booms, as well as the construction work on Muscle Shoals.

Decatur and Albany, known as the "twin cities," are enjoying industrial prosperity at present, and their near neighbor, Huntsville, in Madison County, is also prosperous.

Tuscaloosa County, particularly the town of Tuscaloosa itself, is getting its share of the industrial prosperity. The operations of the Central Iron & Coal Co. are located at Halt, near Tuscaloosa, and this and the other industries of the section are going at full speed.

Walker County, of which Jasper is the county seat, is feeling the effects of the peak coal production. The Empire Coal Co. is at present constructing a large by-products plant in this county.

The counties named form the main part of Alabama's industrial and mining section. All of them are good markets when their products are being sold, and they have never enjoyed a better sale than at present.

NEW YORK ENDORSES FLYING FIELD SITE

NEW YORK, April 10—The Merchants Association has indorsed the plan to acquire Governor's Island as a flying field for commercial aviation, the report of the committee investigating the plan stating that "the development of commercial aviation in the United States is dependent principally upon the establishment of adequate and conveniently located land and starting fields in the large industrial centers, the traffic of which alone will bear the expense of an air service."

At present 146 cities in the United States have established municipal landing places.

CASTINGS PLANT BURNED

TOLEDO, April 11—The plant of the United States Malleable Castings Co. was destroyed by fire last Friday with a loss estimated at $300,000. The company was working on Cleveland and Chandler orders.

Finance Companies Praised by Banker

Members Told That Their Business Caused No Loss to Banks in 1920

CHICAGO, April 7—A banker, Dr. Lichtenstein of the First National Bank, told the members of the Central Auto Finance Association last night that their business was one of the very few interests that did not cause any losses to banks in the depression of 1920.

The occasion was the second annual dinner of the association, which includes in its membership the leading automobile finance companies of this section. Among the guests were the executives of the commercial paper department of seven large banks of Chicago and visitors from sixteen cities.

Other Cities Interested

The latter were present to learn more of the association plan. Minneapolis, Kansas City and Omaha were among the cities interested. Walter Heller, president of the association, explained that this association was a part of the national organization which includes New York, Cleveland, Pittsburgh, Indianapolis, St. Louis and Chicago.

Dr. Lichtenstein spoke to some length on present business conditions. He said that business from a production standpoint was approaching the high figures of 1920, but that so far speculation in commodities was lacking, with a consequence that inflation does not appear to be dangerous. It was commodity speculation, he said, that produced inflation. Everything to date indicates that manufacturers and merchants were buying for reasonable periods ahead.

S. S. Stratton, a veteran in the commercial acceptance business, told of the small losses in carefully managed houses and of the benefits of records that prevent duplication of securities. His company, he said, last year earned less than one per cent of the turnover of capital and surplus, and he stated that the satisfactory total profit was due to the frequent turnover. He likened the automobile finance companies to banks in their earnings and methods of doing business.

Out of "Loan Shark" Class

In support of his assertion that this business had long ago ceased to be a "loan shark" business and had earned a place in other lines of banking, he read the conclusion of an eight-page report in the January number of the Federal Reserve Bank Bulletin. Following the excellent standing given this class of business in that bulletin, Stratton suggested that an effort be made to have paper handled by these companies put on the rediscount list. This suggestion was generally approved by the representatives in attendance.

Men of the Industry and What They Are Doing

R. H. Salmons Resigns

R. H. Salmons, one of the outstanding figures in the truck industry, has resigned as vice-president of the Selden Truck Corp.

Mitchell Directs Mason Sales

Sam C. Mitchell has been appointed general sales manager of the Mason Motor Truck Co., with headquarters at Flint, Mich. Mitchell started in the automobile business with Studebaker's St. Louis branch, following which he was identified with the Cleveland Tractor Co. at St. Louis for three years. Joining the Dort Motor Car Co. as district sales manager in the south central States, he became special representative of the company, a position he held up to the time of joining the Durant forces, in the Mason truck division.

Clements May Operate Cotton Gin

Thomas Clements has resigned as vice-president and comptroller of the Firestone Tire & Rubber Co. The Firestone company, it is understood, will relinquish its interest in a subsidiary cotton ginning plant at Phoenix, Ariz., and it is expected that Clements will take over control and operation of the gin. Clements has been with Firestone for six years.

Cole Names Anderson Sales Head

Caryl H. Anderson, who has been doing special sales work in the State of Iowa for the Cole Motor Car Co., has been appointed sales manager of the company. Previous to joining Cole, Anderson was associated with the J. I. Case Plow Co. of Kansas City as general manager of the Kansas City branch.

Martens Assistant Sales Head

W. E. Martens has been made assistant general sales manager of the Traffic truck division of the National Motors Corp. Martens has been connected with the Traffic company since his resignation from the Naval Reserve Force after the war.

Pettit with Simmons Company

Milton H. Pettit, identified with the J. I. Case Threshing Machine Co. of Racine, Wis., for twenty-one years and since 1915 serving as vice-president in charge of production and a director of the company, has been chosen operating executive of the Simmons Company of New York, of which he has been elected vice-president, director and member of the executive committee.

Davidson Will Assist Hoepli

The appointment of W. H. Davidson of New York to special work with the Department of Commerce has been announced by M. H. Hoepli, acting chief of the automotive division. Davidson will have charge of the work of the division in connection with automobile accessories. He will assist in lining up American accessory exporters and endeavor to work out a list of firms engaged in foreign trade. He will also compile an official list of automotive accessory jobbers in other countries.

Gordon Lee to Visit Europe

Gordon Lee, foreign sales manager of the Yellow Cab Manufacturing Co., is sailing for Europe on Saturday, April 21. He will visit France and England.

The Yellow Cab company is incorporating branches in these two countries and plans to build a sales organization to cover the European market. Orders have already been received from operating companies in London and Paris, as well as from Copenhagen, Lisbon, Madrid and other European cities. A sales campaign in Latin America also is being instituted. Lee will return from Europe early in June.

Pullman Appoints Brewster

The automobile body department of the Pullman Co. announces the appointment of Henry Brewster to its engineering and designing department. Brewster is well known as an automobile body engineer and builder, having been connected with Brewster & Co. of New York, C. P. Kimball & Co. of Chicago and Smith-Springfield Co. of Massachusetts.

Rude Goes with Bundy Tubing

T. M. Rude is withdrawing from J. J. Lamb & Co., Detroit, western representative of the J. C. Haartz Co., of Boston, to become identified with the Bundy Tubing Co., of Detroit, in charge of sales.

Baer Philadelphia Representative

Carl A. Baer, member of the American Institute of Electrical Engineers and recently associated with Baer, Cook & Co., has been placed in charge of the Philadelphia office of the Dwight P. Robinson & Co., engineer and constructor.

Riskin in Business in New York

R. R. Riskin has resigned as vice-president of the Morgan Manufacturing Co., Keene, N. H., to engage in business in New York.

Boston Tech Asks Fenn to Speak

F. W. Fenn, secretary of the motor truck committee of the National Automobile Chamber of Commerce, has been invited by Professor C. B. Breed of the railway and highway engineering division of the Massachusetts Institute of Technology to address his class on transportation subjects on April 13.

Stadelman Becomes Goodyear President

Succeeds E. G. Wilmer, Who Is Elected Chairman of Board of Directors

AKRON, April 11—George M. Stadelman, vice-president of the Goodyear Tire & Rubber Co., was elected president by the directors today, succeeding E. G. Wilmer.

Under the plan proposed by Wilmer and approved by the directors, Wilmer becomes chairman of both the board of directors and the executive committee and continues as president of the California and Canadian companies. He will carry full responsibility for the supervision and direction of the Goodyear management.

P. W. Litchfield, vice-president and factory manager, becomes first vice-president and Frank K. Espenhain, assistant to Wilmer, also is made a vice-president.

Wilmer will remove his offices to New York May 1 and will locate permanently there. Espenhain will be his personal representative in Akron. Stadelman has been with Goodyear since 1901.

White Reports Increase in Sales of 78 Per Cent

CLEVELAND, April 10—White Motor Co. business for the first quarter of the year showed an increase in orders of 78 per cent and an increase in truck deliveries of 67 per cent over the same quarter in 1922.

Orders received during March were greater, the company reports, than for any month in the company's history with one exception. Collections for March were the largest since September, 1920.

Burr Heads Klaxon Division

Harry Burr, who for several years has been connected with the equipment division of the Klaxon Co., has been placed in charge of this work with headquarters in Detroit. He succeeds Campbell Wood, resigned.

Walter P. Coghlan Resigns

Walter P. Coghlan has resigned as vice-president and director of sales of the Trexler Co. of America, maker of automotive specialties.

J. P. Barnum Promoted

J. P. Barnum has been promoted from assistant sales agent of the Union Drawn Steel Co. of Beaver Falls, Pa., to become Eastern sales agent, succeeding Louis W. Williams, resigned.

Christmas Club Plan Used to Sell Fords

Sum of $5 Deposited in Local Bank Will Start Fund for Purchase of Car

(*Continued from page* 841)

the plan and help you to get started toward the ownership of a Ford car.

The plan works out somewhat after the fashion of the Christmas Club and other special savings plans instituted by banks, except that there is a definite purchase as an objective. In making his first deposit there is an obligation on the part of the prospective buyer to go through with it, and he is definitely committed to taking a Ford car at a time when he has accumulated enough for a down payment on the particular type of car he selects.

Varying sums can be paid in weekly, according to the saving capacity of the individual family. In every case, however, a $5 down payment is required to open the account. There can be no withdrawal except for definite cause, and this is left to the discretion of the bank to determine. There are clauses allowing for interrupted payments, etc., and for the final payments after the car has been delivered.

Banks Govern Interest Payments

The dealer with whom the account is started is the dealer who makes the sale. From the time the down payment is made the handling of the account rests with the bank, and frequent reports will be made to dealers on the progress of the account. Payment of interest on the deposits is a matter of individual bank policy on savings, some accumulating quarterly and some semi-annually. Persons applying at banks will be given information on the plan and referred to the Ford dealer in their locality for a contract.

Bankers who have subscribed to the plan are in the main Ford depositories, especially in the larger cities, but connections have been made in all sections through Ford branches and assembling factories and through traveling representatives. In Detroit the plan has the cooperation of nine central banks which have sixty-six branches in all. There is no fixed number of Ford depositories throughout the country, these being constantly changed to meet the requirements of the company.

Support Given in Detroit

The following notice was run by Detroit banks announcing their cooperation in the plans:

In following out your policy of extending our facilities in whatever way we can serve the public, we have arranged to become depositories for payments made in connection with the new Ford weekly purchase plan.

We realize what the automobile means to the average family in bringing them greater enjoyment of life, and believe our action in helping those who desire to become Ford owners will be appreciated by many families who can now realize that ambition through the new Ford weekly purchase plan.

Under this plan you can begin with an initial deposit as low as five dollars. Then select the type of Ford car you want and arrange to make weekly deposits, on which interest will be computed at our regular savings rate. Get the nearest Ford dealer to explain this plan to you and designate one of the following banks as the depository for your payments.

Start today and before you realize it you will be driving your own car.

Officers of banks in Detroit declared they considered the plan to be an excellent means of starting many people on a systematic savings system through life. There is the additional local reason, bankers said, in that the plan makes for greater expansion of the automotive industry, and this means greater prosperity for Detroit.

Chicago Banks Cooperate

CHICAGO, April 19—About 40 banks in Chicago have agreed to cooperate in the new savings account sales plan announced this week by the Ford Motor Co. These banks joined a large newspaper advertisement through which the general principles of the plan were announced to the public.

It was stated that a savings account for the purpose of buying a Ford car could be started with $5 and continued with deposits of $5 or more weekly, the regular savings bank interest being paid on the deposits.

When the deposits amount to one-third of the price of the car the customer may obtain delivery of the car, but officials of the Chicago branch of the Ford Motor Co. said depositors would be encouraged to accumulate the full price before asking delivery of the car.

180,000 *FORD CARS DELIVERED IN MARCH*

DETROIT, April 10 — Record breaking deliveries of Fords in March has had the effect of clearing away all the cars that were in transit or in stock in practically every section of the country.

Going into April the company is working without any surplus in cars whatsoever and orders are running from 500 to 1000 daily in excess of production, even at the rate of 6400 a day. Owing to poor railroad conditions in January and February the company had thousands of cars tied up in transit.

This fact made it possible to deliver the unprecedented total in March as the production in that month was only about 150,000 whereas deliveries approximated 180,000.

Unless there is another tie-up of cars in transit it will be impossible for the present to deliver as many cars again in a single month, as the output limit is about 165,000.

Ford Plan Indorsed by Other Producers

Say It Is Constructive Move Although They Find Some Objection to It

DETROIT, April 10—The general attitude of other manufacturers on the new weekly purchase plan instituted by The Ford Motor Co. is that it is a constructive move and will bring many new buyers into the market. The one serious objection to it is that many persons might be led to buying cars who cannot afford to operate them. With precautions against this, the general feeling is that the plan should prove very successful.

It is pointed out that the Ford company as builder of the lowest priced cars is the logical company to institute this plan, as it appeals directly to the buyer who must take the lowest priced car he can get.

There is this distinction, however, that the Ford plan is not directed entirely at the limited-means class of buyer so much as to the buyer who might easily maintain a car but has been too indifferent about saving to accumulate the first payment of his own volition.

Plan Only New in Introduction

The plan is only new in its introduction, it is pointed out, as several manufacturers in other price fields have considered it but abandoned it because of the impracticability of keeping buyers in line for a particular make of car. In Ford's case this will be less difficult, because he is offering the only car in its price class, it is declared, but even so, some doubt is expressed of the power to hold prospects in line, should they determine to switch to some other makes.

Though there was some talk of the plan having the effect of setting up a corner on future lower-priced car buying, this is conceded to have little weight, as buyers taking advantage of the plan in the main would be unable to purchase other makes of cars anyhow.

The main effect of bringing in new owners will be beneficial to the industry, executives declare, and for that reason the plan is generally indorsed. As adaptations of it may be made to fit the general merchandising plans of other companies in other price classes, it is likely they will be instituted.

Plans for "New Detroit" at Ridgeway Abandoned

WINCHESTER, VA., April 10—"New Detroit" is no more.

Following the warning issued by the West Virginia State auditor to the public against buying stock in the recently proposed $6,000,000 automobile plant and town site at Ridgeway, Berkeley County, W. Va., ten miles north of here, the whole project has been abandoned, it is announced.

Closed Car Business Keeping Prices Level

Profit Now Sufficient to Carry Along Open Models Without Increasing Lists

DETROIT, April 10—Continuance of a large volume of closed car business is having an important effect in keeping prices at the present figures, something which probably would be impossible if the business were largley on open cars as before. In almost every case that price increases are mentioned it is the open cars which would show the largest additions with only moderate increases to the closed car models as a protection from probable further market advances.

There are a number of companies in the industry which report that they are making open cars practically at a loss, but by pushing the sale of closed models they are able to escape the possible ill effect of advances. So long as there is a good steady market for closed cars there is the possibility of deferring the necessity for making price increases, and unless material costs maintain their upward trend it may be possible to escape them entirely.

Safe Profit Margin on Closed Cars

Closed cars always have been priced sufficiently high to give manufacturers a safe profit margin, this being due to production difficulties and the former relatively low output of this type. A large part of the cost has been due to the extra labor and time required rather than additional material.

As demand increased, prices were still kept relatively high because of manufacturing uncertainties. Consequently the closed car, priced safely before, is now found priced high enough to give makers an adequate margin of profit.

What percentages of output is closed cars varies with all manufacturers, but in every case it is considerably higher than a year ago, and in most cases is showing steady gains monthly even over the high outputs of winter months. With summer approaching, there is not a factory in the industry whose output now is not better than 30 per cent and in most cases it is better than 50 per cent closed cars.

Prices Hinge on Sustained Buying

The Hudson-Essex business is almost exclusively closed car business, due to the low prices on their models and the concentration of selling upon these types. If city buying falls off considerably and the rural and farm buying turns mostly to open models, as expected, this contingency probably will cause a general increase in prices.

Should there continue to be the present proportion of output between the two models, prices may go on as now. In any event the prices on open models will be advanced more than the closed.

Factory earnings from this time on will be free from the incidental costs and from costs entailed in storing cars and in driving them away. It takes money to drive cars to storage places, and the cost of storage is largely borne by the factory. In the past month one of the soundest companies in the industry did little more than break even because of incidental costs such as these, and its month was the largest sales month it ever has enjoyed.

Prices of Specialized Trucks Will Be Higher

DETROIT, April 11—Price increases on truck parts by unit parts makers foreshadow a general rise in specialized truck prices, according to manufacturers here, and there is likelihood that these will become effective within the next month.

The increases will be moderate and will represent the additional cost of parts and materials entering into truck construction. These are in addition to increases made since the first of the year and will be additional to increases reported in the past few weeks. In making the new prices public, the companies say they are anxious to avoid the impression of stringing out increases over a period of several months.

Gardner Advances Prices on Open and Closed Cars

ST. LOUIS, April 9—The Gardner Motor Co. has announced an advance in the prices of all models, the new schedule showing increases ranging from $30 on the standard open models to $80 on the sedan.

The following is the revised list:

	Old Price	New Price
Roadster	$965	$995
Phaeton	965	995
"Radio" Sport Phaeton	1,095	1,145
Coupe	1,095	1,445
Sedan	1,365	1,445

Plants Following March in Production Schedules

(*Continued from page* 840)

the part of fleet owners is reported by manufacturers.

Tractors are moving more readily, farmers giving further evidence of a disposition to make greater purchases than they did last year. Better farm conditions, in the South and West, particularly, are reflected in the upward trend of both truck and tractor production.

Sales by parts makers are keeping pace with operations in motor vehicle plants and March is expected to show somewhat the same gain as reported in February over the preceding month. The fact that collections have been uniformly good has been one of the outstanding features of this branch of the industry.

Subsidiary of G.M.C. to Market Ethyl Gas

General Motors Chemical Co. Has Been Organized to Distribute Product

NEW YORK, April 11—Announcement was made today at General Motors headquarters of the organization of a new subsidiary, the General Motors Chemical Co., which will market through gasoline selling stations, refiners and large distributors a gasoline to which has been added an anti-knock compound which has been developed by the General Motors Research Corp. at Dayton, Ohio.

The anti-knock is understood to consist of tetra ethyl lead, to which is added a second compound. These two are in the form of a volatile liquid which is used in the proportion of 5 c.c. per gal. of gasoline for engines of the usual compression. It is expected that the wide marketing of this anti-knock will ultimately result in the use of higher compression engines and thus in greater mileage per gallon of fuel consumed. The higher the compression, the greater the amount of anti-knock required. The anti-knock is mixed with ordinary gasoline.

This knock preventive was developed after many years of research initiated by C. F. Kettering and carried forward by Thomas Midgley, Jr., and his associates.

Master Makes New Start with Assets of $800,000

CHICAGO, April 12—Reorganization of Master Trucks, Inc., has been completed. Following the dismissal recently of a petition in bankruptcy filed against the company, a new concern, known as the Master Motor Corp., has been organized and has purchased all assets and good will of the old corporation. It will operate the company's truck factory in this city.

According to H. C. Keenan, vice-president and general manager, the new corporation will have assets of approximately $800,000 and no direct liabilities. There have been no changes in personnel, and the manufacture and marketing of trucks will continue without interruption, Keenan said.

GRAY PHAETON LISTS AT $520

DETROIT, April 11—An increase in price of $30 on the standard five-passenger phaeton is announced by the Gray Motor Corp. The phaeton now lists at $520 as against the former price of $490. The remainder of the line of models remains unchanged in price.

MOLINE PLOW HIGHER

MOLINE, ILL., April 10—The Moline Plow Co. has announced an increase of $75 in the price of the Moline tractor, model 9-8 now being quoted at $725 as against the former price of $650.

Dealers Had 400,000 Used Cars, March 15

Represent $152,206,340 Investment, N. A. D. A. Reports, Following Survey

ST. LOUIS, April 9—Following a compilation of figures secured from 3333 dealers in eighteen States, the National Automobile Dealers Association estimates that on March 15 there were 400,000 used cars on the floors of the retailers, representing a total capital investment of $152,206,340, and computes the losses that the dealers will absorb on this stock and investment in the first three months of 1923 as $23,591,982.

The dealers answering the questionnaire circulated by the association acknowledged stocks totaling 37,015, with a capital investment of $13,350,119. The study shows that there is an average of 10.88 cars in the hands of 38,000 dealers, with an average capital investment of $4,005.43 for each dealer.

Lowest Allowance in Iowa

The figures disclose that the average price being allowed by dealers for used cars is $360.67, and it is expected the public will pay less than the average figure quoted. The lowest average allowance reported was $259.16 in the State of Iowa and the highest was $522.40 in Louisiana.

The largest average dealer loss was recorded from Louisiana as $2,004.74 and the lowest, $241.40, from Minnesota. It is estimated that automobile stocks are turned four times a year, and if the losses here shown are the experience of each turnover, the losses for 1923 will exceed the total of 1922.

In a statement, C. A. Vane, general manager of the association, says:

The capital invested is the cost at which the dealers acquired these stocks and does not include the figures for reconditioning, overhead, etc. They are the bare figures of what the dealers allowed for these cars in accepting them in trade on new car sales. These figures do not include reports from exclusive used car stores, but are solely from dealers who are handling used cars as part of a new car business.

Market Value Uncertain

The market values which these same dealers report is accepted as the actual worth of these used car stocks and attention is called to this peculiarity—that it is almost impossible for anyone to establish a market value for any article until that article has been sold. N. A. D. A. executives believe that the market values reported are simply figures for which the dealers on their own best judgment expect to sell these cars. Fluctuations can have an immense effect on the ultimate results when these used car stocks have been moved.

Accepting the figures as reported, however, as the actual value of the used car stocks on hand March 15 in eighteen States, there was an apparent loss of millions. The acquisition cost was $1,391,480 more than the present market value reported. This represents a loss of capital investment amounting to .155 per cent. Applying this percentage to the total car stocks and the total capital investment that is evident for the entire 38,000 dealers in the United States, it immediately becomes apparent that the loss in 1923 already is enormous.

Officials of the N. A. D. A. express the belief that these used car stocks and the heavy loss already being absorbed on cars which the dealers either bought during the winter or carried in stock at heavy expense, will have a wide effect on prices that will be offered by automobile dealers the remainder of 1923. It is pointed out that the stocks on hand involve an enormous capital that must be freed for purposes of new stocks and that with the experience of the first three months, the dealers can be expected to refuse to buy old cars at prices that will make heavy losses certain.

Ajax Earned $1.05 Share First Quarter This Year

NEW YORK, April 9—Business for the Ajax Rubber Co. for 1922 was 48 per cent better than that of 1921, while the first quarter of the present year shows that the dollar volume of sales is more than double that of the corresponding period a year ago, according to the annual report of Horace De Lisser, chairman of the board.

This report gives net profits of $26,537 after interest, charges and depreciation, equivalent to six cents a share earned on 425,000 shares of no par common and comparable with a deficit of $5,205,577 in 1921 and $1,277,920 in 1920.

"While net figures for the first quarter of this year have not been finally completed, net profits from operations are approximately $636,695, exclusive of interest, taxes and depreciation, amounting to $188,978," reports De Lisser.

Leylands Lost in 1922; Rolls-Royce Made Profit

LONDON, March 29 (*by mail*)—Reports just issued concerning two British automobile companies give a very good indication of the state of affairs in general in the British passenger car and truck industries.

Rolls-Royce announces an increased net profit for the year ending Oct. 31 last, while Leylands, one of the best known and largest truck makers, reports a loss of nearly a quarter of a million pounds sterling; the total Leyland deficit for the last two years amounts to nearly £1,000,000 on a share capital of approximately £1,850,000.

Rolls-Royce profits for 1921 to 1922 amounted to £149,208 as compared with £107,326 for 1920 to 1921 and £202,845 for 1919 to 1920.

STEVENS TO BE REORGANIZED

CHICOPEE FALLS, MASS., April 11—The Stevens-Duryea plant continues to have numerous incoming orders and cars are being made at present at the rate of about five a week. It is reported that the receivership will be terminated soon and the plant taken over by a new organization.

Casing Production Continues to Gain

Inner Tube Output Also Higher in February but Solid Tires Show Falling Off

NEW YORK, April 9—Figures compiled by the Rubber Association of America for the Bureau of Foreign and Domestic Commerce show an increase in the production of pneumatic casings and tubes during February as compared with the previous month, but a decrease in the output of solid tires.

A comparative table of inventory, production and shipments is as follows:

PNEUMATIC CASINGS

1922—	No. Mfrs. Reporting	Inventory	Production	Shipments
Jan.	66	4,174,216	2,055,134	1,596,806
Feb.	66	4,691,329	2,084,308	1,562,365
Mar.	63	5,183,286	2,645,790	2,973,963
April	65	5,464,336	2,401,187	2,086,651
May	65	5,523,095	2,721,503	2,639,273
June	64	5,042,147	2,838,890	3,133,260
July	63	4,834,106	2,476,636	2,695,095
Aug.	63	4,629,392	2,905,209	3,029,823
Sept.	64	4,612,037	2,504,744	2,502,106
Oct.	64	4,682,958	2,674,662	2,588,770
Nov.	62	4,964,976	2,733,134	2,379,708
Dec.	59	4,599,208	2,656,942	2,934,079
1923—				
Jan.	62	4,695,916	3,127,270	2,994,297
Feb.	60	5,224,387	3,217,987	2,588,639

INNER TUBES

1922—	No. Mfrs. Reporting	Inventory	Production	Shipments
Jan.	66	5,246,647	2,343,393	1,889,724
Feb.	65	6,141,956	2,596,774	1,702,583
Mar.	63	6,991,118	3,017,511	2,090,737
April	65	7,230,096	2,650,573	2,329,343
May	65	7,189,552	2,970,696	2,938,947
June	64	6,186,534	3,130,629	3,973,679
July	63	5,675,839	3,086,199	3,630,744
Aug.	63	5,207,228	3,808,224	4,220,055
Sept.	64	5,164,757	3,501,442	3,558,971
Oct.	64	5,488,033	3,787,758	3,420,680
Nov.	61	6,210,053	3,850,908	3,075,023
Dec.	59	5,732,125	3,411,074	3,825,949
1923—				
Jan.	62	5,838,310	3,951,885	3,748,651
Feb.	60	6,771,958	4,039,202	3,001,697

SOLID TIRES

1922—	No. Mfrs. Reporting	Inventory	Production	Shipments
Jan.	11	181,769	40,224	33,294
Feb.	11	183,448	39,492	36,805
Mar.	11	182,197	49,433	48,350
April	11	173,748	46,664	52,309
May	11	170,904	57,640	60,711
June	11	169,808	66,089	63,408
July	11	176,375	71,505	60,425
Aug.	11	189,698	84,313	69,435
Sept.	11	200,016	82,767	66,797
Oct.	11	213,942	85,480	71,275
Nov.	11	234,684	85,775	61,466
Dec.	10	244,061	77,221	64,570
1923—				
Jan.	11	262,462	83,343	60,611
Feb.	11	270,191	75,457	63,394

"Production" and "Shipment" figures cover the entire month for which each report is made. "Inventory" is reported as of the last day of each month.

"Inventory" includes tires and tubes constituting domestic stock in factory and in transit to, or at, warehouses, branches (if any), or in possession of dealers on consignment basis, and as a total represents all tires and tubes still owned by manufacturers as domestic stock.

"Shipments" includes only stock forwarded to a purchaser and does not include stock forwarded to a warehouse, branch, or on a consignment basis, or abroad.

THIRTY LINCOLNS MADE DAILY

DETROIT, April 10—Lincoln production is now reported at thirty cars daily. The addition to the Lincoln plant is being hurried to completion and will give opportunity for largely increased output.

Harvester to Devote Akron Plant to Parts

Assembling of Trucks Will Be Shifted to Fort Wayne Late in the Summer

AKRON, April 10—Expansion of the Akron works of the International Harvester Co. is to take place within the next few months under the company's plans for increased motor truck production. It is understood that the Akron plant eventually will be devoted to the manufacture of motor truck parts, and the assembly of large trucks will be transferred to Fort Wayne, Ind.

As soon as the new assembly plant at Fort Wayne gets into operation some time next month, the Akron plant, which is now making truck parts and assemblying on an average of forty complete trucks a day, will go on an increased unit production schedule in order to supply the Fort Wayne factory.

Later in the summer the assembly work will be shifted to Fort Wayne and the assembly plant of the Akron works will be used for assembly of truck parts.

It is also planned to expand further the Akron plant so as to increase its unit manufacturing capacity sufficiently to supply parts for assemblage of the International trucks at Springfield, Ohio. The Springfield plant does not now receive parts from Akron for assemblage.

The Akron plant, it is stated, will discontinue the manufacture of truck engines, this production to be taken care of at the International Tractor works at Chicago.

The new plans may mean possibly the employment of from 1000 to 1500 more men, it is understood. The Akron works are now employing 1400 men and are manufacturing about 75 engines a day.

Work Progressing at Fort Wayne

FORT WAYNE, IND., April 11—Work on the construction of the truck plant of the International Harvester Co., east of the city, is progressing slowly and it is now believed that production will start about the first of June or July. The construction of the belt line railroad linking up the plant with the various railroads which touch this city will begin at once.

American Financing Firm Has Canadian Subsidiary

TORONTO, ONT., April 10—The Continental Guaranty Corp. of New York (now known as the Commercial Credit Corp.) announces the formation of a Canadian subsidiary to be known as the Continental Guaranty Corp. of Canada, with head offices at Toronto.

The Canadian company will finance the wholesale shipments of motor vehicles from factories to dealers and the retail handling of these motor vehicles when sold by dealers to purchasers on credit.

Since June, 1916, the New York corporation has financed the shipment in Canada of 62,301 cars and has loaned $38,909,122 to dealers and purchasers.

The directors of the Canadian company are B. A. McDonald, president; George A. Campbell, K. C., both of Montreal; R. H. Hill, vice-president, Toronto; A. E. Duncan, chairman of both companies, Baltimore, and H. L. Wynegar, president of the Commercial Credit Corp., New York.

Truck Sales 100 Per Cent Improved in Des Moines

DES MOINES, IOWA, April 11—New car sales here for the first three months of 1923 show a remarkable increase over sales of the corresponding months of last year, according to figures compiled by S. P. Whiting, secretary of the Motor Trades bureau. Passenger car sales are almost 100 per cent better than last year and truck sales show even greater increases. Passenger car sales for January, February and March of this year totaled 1353 as compared with last year's record of 760 cars in the same months.

Truck sales for the first three months of this year numbered 136. During the same period last year only 55 trucks were sold. The following table shows the sales by months:

	Passenger Cars		Trucks	
	1922	1923	1922	1923
January	148	348	12	45
February	211	338	13	50
March	401	667	30	41
Total.....	760	1,353	55	136

Fearing Higher Prices, Oregon City Buys Cars

PORTLAND, ORE., April 7—The rapid advance of spring and the growing belief that there will be an increase in automobile prices shortly are having their effect on the automobile market in Portland, and the last couple of weeks have seen a resumption of business comparable to the times of 1920.

Sales of standard lines have been running heavier than for any time in two years, according to state license figures, the market for low and medium priced cars being particularly strong. The demand for cars in the higher priced field is about on a par with this time last year, although the demand for the lower priced cars is considerably stronger.

While Portland and immediate vicinity are showing marked improvement over previous months, it is in the outlying districts of Oregon that the greatest improvement is being shown.

This is due to the improved financial condition of the farmers and stock men.

During the last several weeks heavy shipments of cars have been made into the outlying districts, these generally being in the nature of diversions of stock coming from the eastern factories.

Rigid Test Imposed on Aircraft Engine

In Endurance Trial Wright E-4 Runs 600 Hours with Wide-open Throttle

WASHINGTON, April 10—The Bureau of Aeronautics of the Navy Department has completed a special endurance test of a Wright E-4 engine, approximating 600 hours with a wide open throttle. Officials of the bureau state that conditions under which the test was made were far more severe than those met with in the air.

The complete official data on the performance of the engine will not be available until May. However, the officers in charge of the investigation stated that one of the surprising developments was the fact that the connecting rods and bearings did not show any marked signs of wear after 600 hours of use. At the start of the test the engine was pulling 200 hp. and at the finish 205 hp., due to the fact that the friction decreased.

The first 250 hours were run with closed head cylinder sleeves, owing to the recessing of valve seats. The cylinder sleeve was changed to the open head type, with valve seating on inserted aluminum bronze seats.

There were no material changes in the construction of the engine during the performance, and the gas consumption was reported normal. The valves were of silchrome steel, and the engine had Kelmet connecting rod bearings. The engine was run steadily until a defect was discovered and repairs were made. The principal development was in the type of the cylinders.

$2,000,000 Damage Suit Based on Window Device

NEW YORK, April 11—The suit of the Perfect Window Regulator Co. against the Fisher Body Corp., the Ternstedt Manufacturing Co. and others for $2,000,000 damages, is on trial in the Supreme Court here.

It is alleged that in January, 1917, the late Alvar K. Ternstedt assigned to the Fisher Body Corp. his invention for a window regulating device for use on closed cars, which the Perfect Window Regulator Co. claimed under another agreement.

The complaint asks damages and an accounting, and demands that all the Ternstedt inventions be transferred to the plaintiffs.

MOTORCYCLE MOTORS DUTY

WASHINGTON, April 11—With a view to applying countervailing duties, the Treasury Department has issued a decision stating that motorcycle motors are dutiable under the Swedish tariff at the rate of 1.60 crowns per kilo net weight.

Court May Terminate Kelsey Receivership

Majority of Creditors Assent to Such Action—Reorganization Contemplated

NEW YORK, April 10—An order to show cause why the receiver should not be discharged is returnable next Monday in the case of the Kelsey Motor Co. of Newark, N. J. It is expected that the action will be favorable and that Receiver Young will be relieved of his duties, following which there will be a reorganization of the company.

The creditors' committee, which has been working on the case, has offered creditors their choice of two propositions. One is the payment of their claims with 60 per cent in bonds, 25 per cent in stock and 15 per cent in cash, while the other is 33 1/3 per cent in cash in full settlement. The approval of 75 per cent of the creditors is required to bring the receivership to an end, and it is said that this number already have agreed.

All through the receivership the factory has been in operation, and the company reports that the gear car especially has met with a favorable reception. If the receiver is discharged, the new company, which also will be called the Kelsey Motor Co., will begin operations without change of personnel, C. W. Kelsey continuing as president.

Overland Will Reduce Debt to $10,000,000

TOLEDO, April 10—Preparations for the payment of $3,500,000 to the Union Trust Co. have been made by the Willys-Overland Co., which will reduce the present bonded indebtedness to approximately $10,000,000.

The aggregate payments on the funded bank debt during the last ten months have been about $7,000,000 including the present payment.

Sale of real estate not used in the production of cars has enabled the company to apply large sums to the reduction of the debt which becomes due Dec. 1, 1923. Company officials are assured that they will suffer no embarrassment in the extension of the unpaid portion if it is not all liquidated by the end of the year.

Estimates G. M. Quarter's Earnings as $18,500,000

NEW YORK, April 9.—An analysis prepared by Dominick & Dominick and Laird, Bissell & Meeds, members of the New York Stock Exchange, estimates the net earnings of the General Motors Corp. for the first quarter of the current year as $18,500,000.

The analysis adds that "with estimated net earnings for the first quarter of this year, $18,500,000, and with dividend requirements on the debenture and preferred stocks amounting to slightly more than $1,600,000 for the period, there was left a balance of approximately $17,000,000 for the 20,557,750 shares of common stock outstanding. The senior dividends were earned 11½ times. In 1922 the company earned $51,807,448, or eight times the dividend requirements on the senior securities."

FINANCIAL NOTES

Mullins Body Corp. has declared a regular quarterly dividend of $2 on the preferred stock, payable May 1 to stock of record April 17.

Hupp Motor Car Corp. has declared a regular quarterly dividend of 25 cents a share on the common stock, payable May 1 to holders of record April 14.

Lansing Forge Co. has applied for authority to increase its capitalization from $300,000 to $500,000 due to the need of additional equipment to care for increased business. Business in the first three months of the year showed a 50 per cent increase over last year's quarter.

Chandler Motor Car Co. estimates net profits for the first quarter of $1,250,000 or $4.45 a share on the 280,000 shares of no par value capital stock outstanding on a three months production of about 5000 cars. It is expected 10,000 cars will be manufactured in the second quarter.

Maxwell Motor Corp. earnings for the first quarter of 1923 are expected to approximate $1,000,000, which compares with a loss of $600,000 in the corresponding period in 1922. Based on the first quarter, Maxwell earnings may equal the amount of the company's outstanding notes of $6,300,000.

Cortland Cart & Carriage Co. stockholders have voted to increase the capital stock to $1,000,000. The increased capital will provide for a larger production of Hatfield cars and a more active sales campaign, plans for which are being formulated by Harry T. Clinton, who recently joined the company as assistant general manager.

McQuay-Norris Mfg. Co., St. Louis, manufacturer of piston rings, pistons, piston pins and bearings, is offering for public subscription through brokers 33,333 shares of common stock at $25 a share to provide additional financing. The company has recently expanded its manufacturing facilities by acquiring new plants in Indiana. No changes in management are contemplated, it is said.

R & V Motor Co. and **Root & Vandervoort Engineering Co.** have reduced their capital stock to comply substantially with the actual value of issued and outstanding stock. The reductions are merely an adjustment through which the corporations will reduce their annual franchise tax so that they will pay on the basis of actual stock in operation rather than on the total amount authorized, much of which has never been issued. The R & V stock is cut from $6,500,000 to $2,730,000 and the Root & Vandervoort, the holding corporation for R & V interests, from $7,500,000 to $2,400,000.

CANTON SPRING SOLD

CLEVELAND, April 6—The Canton Spring Co.'s plant of the Standard Parts Co. has been sold by Receiver F. A. Scott at private sale to the American Mine Door Co., a Canton corporation. The purchase price was $47,000.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

The growing volume of business is reflected in the increased volume of payments by check and bank clearings. For the week ending April 4 bank debits to individual accounts as reported by 243 centers totaled $10,085,000,000, an increase of nearly 10 per cent or $929,000,000 over the preceding week. Although this increase is partly explained by end-of-month settlements, the volume is still more than a half billion dollars greater than for the similar week in 1922.

Increasing demands for credit are shown by the latest statement of 777 member banks of the Federal Reserve System. There was an increase of $33,000,000 in loans and discounts and a net liquidation of about $30,000,000 of investments. The above mentioned statement is always a week behind the Federal Reserve Board's weekly report, which showed a decline in the reserve ratio from 75.5 to 75 per cent in the week ending April 4.

There was a further stiffening last week of interest rates on all maturities from sixty days to six months. The rate is now 5½ per cent, as compared with 5¼ to 5½ per cent a week ago. Average weekly wholesale prices are higher.

March was a month of exceptional business activity. Production records were broken in building as well as in iron and steel output. The peak of wartime production in pig iron reached in October, 1916, with 3,508,849 tons, was surpassed with a record output of 3,521,275 tons. Steel ingot production was the highest on record. The output of 3,402,000 gross tons showed a gain of nearly 500,000 tons over February and more than a million tons in excess of March, 1922. The eleven per cent increase in wages in the steel industry follows closely on the recent announcement of wage increases in New England textile mills. Reports of active spindles in the cotton goods industry show that this industry has expanded nearly to capacity.

The volume of traffic moved on the railroads during the last eight months is the largest in the history of the country.

General Motors Directors Take Action on Dividends

NEW YORK, April 11—Directors of the General Motors Corp., at their meeting today, declared the regular quarterly dividends of $1.50 a share on the 6 per cent preferred, $1.50 a share on the 6 per cent debenture, and $1.75 a share on the 7 per cent debentures. These dividends are all payable May 1 to stockholders of record April 21.

The annual meeting of the General Motors Corp. will be held at Wilmington, Del., April 18 and on the following day, at Detroit, there will be the usual reorganization meeting of the newly elected directors.

Export Trade Shows Continued Expansion

8851 Automobiles and 1698 Trucks Were Shipped Overseas During February

WASHINGTON, April 11—Continued growth of the export sales of American automotive equipment is revealed in the export statistics for the month of February, made public here today by the Bureau of Foreign and Domestic Commerce.

The records show that 8851 passenger automobiles, valued at $6,282,624, were shipped abroad in February, as compared with 6044, valued at $4,579,548 in January. The truck exports in February were 1698, having a value of $1,092,400, a striking increase from the 1352, valued at $740,697 in January.

Of the February shipments, nearly 400 were of the larger sizes of trucks above one ton in size, the smaller trucks numbering 1302 with a value of $467,051. Parts exported in February were $4,570,700, in addition to which automobile service appliances to the extent of $22,178 were shipped overseas.

The Government figures covering engine exports, with February, are being noted in more detail than previously. Ten headings of various classifications are now being made, in comparison with six heretofore.

The shipments announced today by the Commerce bureau were those from the United States, the Canadian exports having been given out previously. These showed that 5668 cars and 438 trucks were sent abroad from Canada during February.

Nash Reports $1,573,242 Income for Three Months

KENOSHA, WIS., April 10—Following the declaration of the regular quarterly dividend of 1¾ per cent on the preferred A stock, payable May 1 to stock of record April 20, directors of the Nash Motors Co. issued a statement, saying:

"Net income for the three months, December, January and February, after deducting expenses of manufacturing, including depreciation, selling, administrative and local and federal taxes, was $1,573,242. The factories of the company are running at capacity and, in fact, are unable at the present time to fill orders by a wide margin. Profits for March are not reported, but it is probable they will exceed the average for the preceding three months, and the outlook for the next few months, at least, is excellent."

BUYS INTEREST IN IRON WORKS

DECATUR. ILL., April 9—The Decatur Malleable Iron Works is being linked with the Danville Malleable Iron Co. and the Allith-Prouty Co. of Danville through the purchase of a working interest by Donald E. Willard, president and treasurer of the Decatur company, in the other two. This will unite three of the largest down-state iron works, with headquarters in Danville. The Allith-Prouty company produces builders' hardware but the other two turn out castings.

INDUSTRIAL NOTES

Perfection Tire Co.'s property at Fort Madison, Iowa, has been ordered sold by the court, as the result of an application by Paul S. Junkin, receiver. The court order directs a private sale and includes everything except a few articles specified for repairs for the plant. Raw material to the amount of 14,271 pounds, 42,000 inner tube valves and work in process and chemicals, oil and compounded stock will be sold.

Superior Motorcoach Body Co., Lima, Ohio, has been organized by Lima men and capitalized at $100,000 for the construction of motorbus bodies. Emmet R. Curtin is president of the concern.

Fyrac Manufacturing Co., Rockford, Ill., has moved its offices to a location adjacent its manufacturing plant, the change making it possible to undertake a program of expansion necessitated by the demands of its growing business. The company is about to introduce a new timer and the new factory space available will make it possible to rush this work.

Ryan-Bohn Foundry Co. operations under the receivership were increased in March to total value of $140,000 and this amount is expected to reach $160,000 in April. By June the company is expected to be operating on a $200,000 a month basis. The foundry is operating principally on cylinder blocks for Reo, Olds, Durant and Star cars.

American Gear Grinder Co. has been organized in Detroit, by A. J. Ott, formerly head of the Ott Grinder Co. of Indianapolis, to manufacture gear grinding machines. A. J. Ott is president and treasurer of the company and C. L. Ott, secretary.

New Road Builder Model Turned Out by Ruggles

SAGINAW, MICH., April 9—The Ruggles Motor Truck Co. has commenced production on a new road builder model which is especially adapted to the requirements of contractors.

The wheelbase is 115 in. and the maximum total weight, including chassis, body and load is 13,000 lb. The truck has a four-cylinder, 4 x 5 in. engine, Brown-Lipe clutch and gearset, and a double reduction rear axle.

CANADIAN DUTY ON WHEELS

WASHINGTON, April 9—The Treasury Department has imposed countervailing duties on automobile wheels imported from Canada. Customs collectors have been notified by the department that the Dominion has classified wheels, complete with nuts, bolts, rims and cups, at the rate of 35 per cent ad valorem when imported from the United States.

METAL MARKETS

Announcement on Tuesday of this week that the U. S. Steel Corp. had recommended to the presidents of its subsidiary companies an 11 per cent advance in the wage scale of common labor and a corresponding readjustment of the wages of other employees imparted fresh vigor to the steel market at a time when many had looked for a turn in its tendency. So far as concerns fresh buying, the market is in the twilight zone of a pronounced calm. There is a slowing-up in representative commitments, partly due to producers' inability or unwillingness to book additional business at this time, but in part also the result of consumers in some industries having covered their requirements for the present. While the automotive industries continue to absorb heavy tonnages of steel products, the activity of purchasing agents at this time is devoted more to the expediting of shipments previously contracted for, and to the securing of odds and ends to stop gaps between arrivals of shipments than to the placing of new orders for large tonnages.

Even in sheets, although they continue to be the most difficult of all steel products to obtain, a somewhat easier tendency is beginning to make itself felt. This easier tendency pertains in no wise to prices, but to deliveries. Mills rolling full-finished automobile sheets that a few weeks ago declined to book business for June shipment have let it be understood that desirable specifications from regular customers will be considered at approximately prevailing price levels. Sheet bar producers have also become somewhat more accommodating and have virtually assured their regular trade among the non-integrated rolling mills that they will be looked after in the matter of June deliveries.

For the time being, capacity in many lines, especially sheets, cold-finished bars and strip, is still taxed to the utmost by the backlog of orders. Eventually, however, this condition will change, and in this connection it is interesting to note that the steel industry for once is showing the liveliest interest in the 1924 outlook for automotive construction and demand. The steel demand from the building industries, with lathers getting in some instances $15 and bricklayers $14 a day, is a frail flower, liable to perish any moment because of the top-heaviness of labor costs. Railroads have bought steel, but their resources are not yet such as to make further expansion in the demand from that source a certainty. In the machinery field the chief outlet has been for steel for machine tools for automotive plants. And it is to the automotive industries that the steel producer looks today for signals indicating the state of demand during the year's second half.

Pig Iron.—The price situation is rather easier at most of the market centers, but buying is largely in single car lots.

Aluminum.—The few interests that have foreign metal to offer for shipment from abroad, and holders of what small resale lots as are in the market, refrain from quoting prices, but are waiting for the market to shape itself into one of more pronounced scarcity. They hold that this scarcity is as pronounced as could be now, but that it has not yet been translated into sufficiently inviting premiums for spot metal.

Copper.—The market for raw copper is still in the lull that followed the recent advance, but wrought copper and brass products hold firm with producers adding daily to their bookings.

Calendar

SHOWS

May 13-20—New York, Spring Salon, Hotel Commodore.

Nov. 4-10 — New York, First Automobile Exposition of the Foreign Automotive Association, Hotel Astor.

FOREIGN SHOWS

April 10-29—Madrid, Spain, International Automobile Exposition at the Palacio de Exposiciones, showing automobiles, motorcycles, accessories and equipment, under the auspices of the Chambre Syndicale de l'Automobile et du Cycle.

May 9 - June 12 — Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.

Oct. 4 - 14 — Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.

Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

RACES

May 10 — Berlin - Grunewald, German Grand Prix.

May 30—Indianapolis, Eleventh Annual 500-mile International Sweepstakes.

July 2 — Tours, French Grand Prix 500-mile race.

Oct. 28—Barcelona, Spain, Grand Prix for vehicles of 1500 c.c.; Nov. 1, International Grand Prix for cycle cars of 1100—Nov. 4, International Grand Prix for two liter.

CONVENTIONS

May 2, 3, 4 — New Orleans, Annual Convention of the National Foreign Trade Council.

May 7-10—New York, Annual Convention of the United States Chamber of Commerce.

May 10 — New York, Annual Meeting of the National Highway Traffic Association, Automobile Club of America.

May 7-12—Seville, Spain, Fourth International Highway Congress.

May 15-16—Detroit, Spring Convention of the Service Managers' Division of the National Automobile Chamber of Commerce, General Motors Building.

Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

Nov. 12-17 — Chicago, Annual Business Exhibit and Convention of the Automotive Equipment Association, Coliseum.

S. A. E. MEETINGS

Metropolitan Section

April 19—Speaker, Edw. E. La Schum. General Superintendent. Motor Vehicle Equipment, American Railway Express Co.; Subject, Engineering Features of Fleet Operation.

May 17—Speaker, F. P. Gilligan, Secretary, Henry Souther Engineering Co., Subject, Metallic Materials for Automotive Work.

Other S. A. E. Meetings

April 19—National Tractor Meeting—Prof. S. O. Sjogren and C. M. Eason — Auditorium Hotel, Chicago.

April 20 — Mid-West Section — General Design of Electric Trucks and Their Performance in Urban Work—J. G. Carroll—7 p.m.—Western Society of Engineers.

April 26-28—Automotive Transportation Meeting of the S. A. E. to be held at the Hotel Winton, Cleveland. Sessions will be devoted to truck, motor bus, taxicab and motor rail car transportation, featuring operation rather than design.

April — New England Section—Chassis Lubrication—C. A. Bacon—8 p.m.—Engineers Club, Boston.

June 19-23—Summer Meeting of the S. A. E.—Spring Lake, N. J.

Oct. 25-26—Production Meeting of the S. A. E.—Cleveland.

Jan. 1924—Annual Meeting of the S. A. E.—Detroit.

MEETINGS

June 14 - 15 — Bethlehem, Pa., Eastern Sectional Meeting of the American Society for Steel Treating, Hotel Reservations made through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem.

June 25-July 1—Dixville Notch, N. H., Summer Meeting of the Automotive Equipment Association.

Indiana Bus Owners to Form State Body

INDIANAPOLIS, April 10—Motor bus owners will meet here April 17 to form a State-wide association, in which it is planned to merge all the local associations of various sections. By building up a strong State organization it is hoped to help the advancement of bus use in Indiana as well as to work out plans for better cooperation between various communities and State and county governmental units.

This month many new bus lines are being formed and expansion is planned by practically every well organized route in Indiana. A service from Terre Haute to Indianapolis, and extensions of the lines to the east of the city to communicate with Ohio lines, are among the plans well under way.

Plans for the State association and the convention were started by the leaders in this city and of bus groups in the northern part of Indiana just after the session of the Legislature which came near to eliminating the use of buses in this State for two years.

Previous attempts to start such an organization were made, but many of the bus men of the State were rather pessimistic regarding the need of such a group.

SETTLING HARLEY AFFAIRS

SPRINGFIELD, MASS., April 10—The affairs of the bankrupt Harley Co. are being rapidly advanced to a settlement. It is stated that $30,000 has been paid in full settlement of taxes and conservation charges. A first payment to creditors of 95 cents on the dollar has been voted by the trustees and approved by the referee in bankruptcy, with a view to a small additional payment. Claims on which these will apply are said to amount to $40,000.

OBITUARY

HENRY B. LEWIS

DETROIT, April 7—Henry B. Lewis, president of the Lewis-Hall Iron Works, died suddenly here Friday. He was a native Detroiter, and except for a brief period has been engaged in business in this city all his life.

He was vice-president of Lewis-Hall Motors Corp. during the life of that company and was also vice-president of the Steering Gear & Parts Co.

WATSON R. SMITH

DETROIT, April 7—Watson R. Smith, secretary-treasurer of the Hi-Power Tool Corp., Jackson, died at his home in that city Thursday, aged fifty-five years. At one time he was employed in the Jackson Cushion Spring Co., now the Reynolds Spring Co., and advanced to the presidency of the latter company.

NATHAN S. POTTER

JACKSON, MICH., April 9—Nathan S. Potter died at his home here Friday. He was a prominent Jackson business man, and in addition to banking and public utility interests was president of the Jackson Body Co. and vice-president of the Hayes Motor Truck & Wheel Co. of St. John's, Mich.

Citroen Shows Film of Trip Over Desert

NEW YORK, April 7—Before an audience made up of members of the Society of Automotive Engineers, André Citroen, French automobile maker, who is spending three weeks in this country, last night showed moving pictures illustrative of the Citroen caravan that crossed the Sahara Desert in December.

The French manufacturer preceded the showing of the pictures with a talk on how the expedition was organized and how it made the successful trip across the desert, a distance of 2000 miles, in twenty days, inclusive of five days of rest. Citroen is planning to make another trial next year with a specially built car, and confidently predicts that the trip can be made in four days.

Five Cars in Caravan

There were five cars in the caravan, each equipped with the Kegresse-Hinstin caterpillar tread. They traveled at a speed of from seven to eight m.p.h and were running eighteen hours a day. Gasoline consumption, because of the sandy going, was about fifteen miles to the gallon. No tire trouble was experienced, because the front wheels, which were shod with pneumatics, carried little weight because of the caterpillar tread.

Citroen predicted a great future for the caterpillar tread in countries where roads are bad or over sandy stretches because of the mobility of cars thus equipped and their speed and comparative fuel economy. Citroen has with him seven of these caterpillar and twelve of the ordinary type of Citroens.